# The Refrigeration Service Engineer

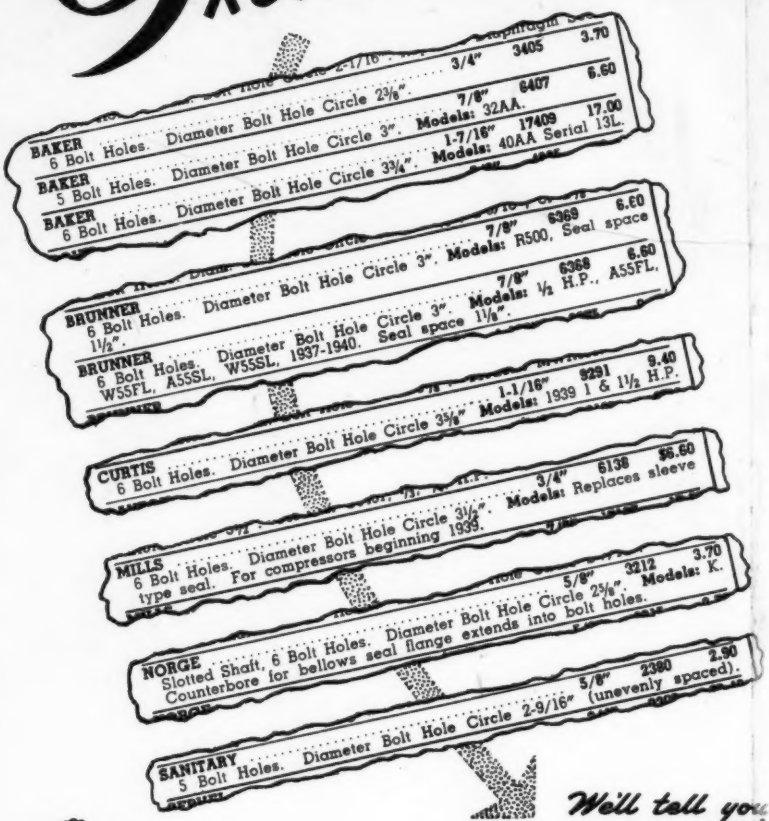


VOL. 9 NO. 1 ★ ★ ★ JANUARY · 1941

**Commercial Selling**
—a new feature
See Page 43

Tech.

# 9 MORE ROTARY SEAL UNITS





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# The Refrigeration Service Engineer

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The Refrigeration Service Engineer

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# Safeguarding an Investment

By LESTER S. DUNN*

MODERN refrigeration systems represent the finest efforts of our engineering, production, sales and field divisions, and it is to you, the field force, that I present this thought. You are the final link between the industry and the customer. Yours is the task of bringing into operating form a wide variety of parts, and the quality of your work is not only a measure of your personal ability, but it reflects upon the industry as a whole. These men look to you, and it is your task to see that you do not let them down, as well as yourselves. Every installation that you work upon represents considerable investment by the industry as well as the purchaser. SAFEGUARD THAT INVESTMENT!

In order that we may determine the factors detrimental to any system, we must investigate the influx into the system of factors other than those for which the system was designed. There are three that come under this classification that we wish to consider: moisture, acid, and sediment.

Moisture is present in all systems and some of its many sources are:

1—Present in equipment when received. Due to modern methods of manufacture this amount is, as a rule, very small.

2—Condensation from the air. This amount can be rather large if the systems are left open for a long period during assembly. This condition is very prevalent in sweat tube installations which take considerable time for assembly and where dehydrated tube is not available.

3—Oils contain moisture, many having more than is good for the system. An oil that will pass a 25,000 volt test may have as much as .3 per cent of water by weight. Dry oils take up water very rapidly and the greatest care must be exercised in handling. Do not pour oil from one container to another. Syphon it, as an exposed thin stream of dry oil will pick up a large amount of moisture. Always use a drier on the breather line of an oil can or drum.

4—Water may be added to the system when it is being charged with refrigerant. Refrigerant gas, in factory filled drums, has a minimum moisture content, but when it is transferred to service cylinders and then to the system much water can be added, if the service drums are not handled with care. Only by careful periodic check up of service cylinders can this trouble be avoided.

5—Water can be created by chemical re-

*Designer D F N System—McIntire Connector Co.

actions inside the refrigeration system. Oxides and acids may be present in the system and they can react to form water. Air, with its free oxygen, may oxidize the oil and combine with the hydrogen in the oil to form water.

6—Machine failure may introduce moisture in the system. A low side leak in units operating in the vacuum range or a broken water cooled condenser will add large quantities to the refrigerant stream.

Water has effects upon the system beyond the formation of ice which causes freeze-up of the expansion valve. These effects are caused by the action of the water upon the refrigerant gas to form acids.

### Acids in Sulphur Dioxide Systems

The action in the case of sulphur dioxide and water is a direct union to form sulphurous acid. This acid is weak and unstable in that it can be broken down and the water removed by a strong dehydrating agent, leaving free sulphur dioxide. Tests of deposits taken from systems show the presence of sulphates and some free sulphur indicating the probable formation of sulphuric acid. This is a very strong and active acid, and its possible reactions are far from pleasant to contemplate. The next time you look at your car battery just examine the deposit on the positive terminal. This is copper sulphate and is formed by the action of sulphuric acid on copper.

### Acids in Methyl Chloride and Freon Systems

In installations using either methyl chloride or Freon the action of water and the refrigerant to form acid is very slow, covering a period measured in weeks. This fact leads to the erroneous idea that moisture, in systems operating at a suction temperature above 32° F., would have no detrimental effect as there would be no freeze-up of the expansion valve. Research has since proved the fallacy of this idea. With either gas, water forms hydrochloric acid which is very strong and active. It will attack most metals and its action with the unsaturated hydrocarbons in the oil forms sludges. The type of sludge formed will vary from a soft gummy mass to a hard deposit on metallic surfaces such as pistons and rings. They are mostly brownish in color and some will turn hard when exposed to the air.

The use of a needle type valve to control the expansion of the refrigerant has, from the first, made the use of adequate screening a recognized necessity. Oil when subjected to heat will break down and liberate free carbon. The lower the grade of oil, the greater the amount of carbon will be formed. This carbon is very finely divided causing darkening of the oil. Sludges resulting from the presence of water in the system add the problem of their proper removal as does the excess flux not consumed during soldering operations.

Having these conditions to contend with what can we do to rectify the situation?

Moisture is controlled by the use of solid drying agents. They can be divided into two groups, insoluble agents capable of reactivation and soluble agents incapable of reactivation.

### Class 1

*Activated Alumina* — This agent is chemically inactive with the refrigerant stream and will not dissolve, change in shape or size. It can be made active again by the application of controlled heat, but due to the presence of oil and dirt on the granules, it is inadvisable to do so except in an emergency, as the oils will form carbon reducing its efficiency. This type of agent takes up moisture by adsorbing it in its pores. The water is taken up in the vapor state and this characteristic gives it the ability to take up acid vapors almost to the neutral point. It does not tend to pack or shift during use but has a slight tendency to dust, making necessary positive filtering media at the outlet end of the unit. Excellent as a permanent drying agent.

*Drierite*—This agent can be reactivated by the application of controlled heat, but unlike activated alumina it takes up moisture by a chemical change, forming a hydrate. While this tends to soften the granules slightly, its use over a period of years has proved that this characteristic is not detrimental. Some investigators feel that this type of agent is apt to be very positive in its action. It does not change in size or shape and has a slight tendency to dust. With methyl chloride and Freon it can be used for permanent application. In sulphur dioxide systems it should not be left on the line over six months, as it then has the tendency to affect the oils.

*Silica Gel*—This is a hard and very porous granule, non-dust forming and inactive chemically in the refrigeration system. Like Activated Alumina, it absorbs

the moisture in its pores and is reactivated by the application of controlled heat. At present it is available in fine grains and should not be used in a bed greater than sixteen inches, liquid line application. as excessive pressure drop may develop. Its use in suction line work will have to be gauged by the maximum pressure drop allowed. It has a tendency, due to its size and smoothness, to shift and pack during use. Its extra capacity to take up moisture and freedom from dusting make it one of the best agents available—excellent for permanent application.

### Class 2

*Calcium Chloride*—one of the oldest agents used, having a large capacity and very rapid action with one dangerous characteristic, that, in the presence of an excessive amount of water, it readily dissolves. The greatest care must be exercised in its use so that it will not pass into the system as it is very corrosive. Its use must be restricted to temporary application and oversized units used. Should be limited to emergency use.

*Calcium Oxide*—A fine agent of ample capacity and rapid action. Care must be taken to see that the proper grade is used, one that will not expand too rapidly or cause excessive heat. It has one characteristic which is helpful in that it will, before going into solution, expand to a point where enough restriction is formed to cause the gas to expand. This gives outward indication by sharply reducing the temperature of the drier shell, at times causing it to frost up.

Neutralization of the acid in sulphur dioxide systems is accomplished by the use of strong dehydrating agents, which break down the acid by absorbing the water and liberating sulphur dioxide. This can be effected best in the vapor stage of the cycle by placing the drier in the suction line.

In Freon and methyl chloride systems the process is different as the acid involved is hydrochloric, which, in its dry state, is a gas enabling it to be adsorbed by such agents as activated alumina and silica gel. These agents will reduce the acid content almost to the neutral point. The use of metallic zinc offers two distinct advantages. It will remove the last traces of the acid, and from its discoloration a trained observer can get a close indication of the acid condition of the system. It must be kept in mind that the removal of acid is not a rapid process and ample time must be allowed to assure proper results.

There are three methods used for the removal of sediment from the refrigerant stream. The first to be used was the screen whose degree of protection depends upon the fineness of the mesh and whose capacity depends upon the area of the screen surface. This we designate as a two dimensional function as its capacity depends solely upon the area of its exposed surface. In order that greater capacity could be obtained in a given size unit, a different method was employed in which the depth of the bed as well as its area affected its capacity. This process is known as filtering and it is a three dimensional function. The porocity of the filtering bed is graduated from coarse on the inlet side to fine on the outlet surface, enabling the sediment to be progressively removed with only a small part of the fines ever reaching the final state. Thus in a small space we have created many layers of screening surfaces. This is an adaptation of the method used in filtering plants for drinking water where large capacity in a small space must be obtained. The discoloration of the drying agent is due to the deposit of finely divided particles usually carbon from the oil. This property, of the agent does a great deal in maintaining good lubricating properties of the oil.

### Alcohol

The use of anhydrous alcohol was considered a good method of combating water in the system. We have but to turn to the automobile where plenty of trouble was experienced by the use of alcohol due to its marked corrosive effect in the presence of water. Today, only alcohol treated to prevent corrosion, is used. Water and alcohol do not unite chemically and the water is free to form acids with the refrigerant gas with resulting sludges.

Any discussion of copper plating must be held to a few simple facts, as the chemical side of the picture is complicated and requires additional investigation. Systems using either methyl chloride or freon are susceptible to this condition. Oil soluble copper compounds are taken up by the oil and re-deposited in the form of free copper on polished metallic surfaces of the machine. Tests have shown that this is more apt to take place when moisture is present. The best method to prevent plating is to keep air, moisture and acid out of the sys-

tem and use a highly refined grade of oil.

There are several types of drying units available, each having a definite advantage for a special type of service. The oldest type is the sealed, non-refillable unit excellent for permanent installations where early renewal is not anticipated. The standard type demountable unit with cartridge refills is adaptable to service work and as a permanent unit in a system where periodic inspection and renewal is required. In sweat tube installations where the system is rigidly mounted, the side outlet type with cartridge refills is most adaptable as it can be serviced by the removal of a single cap.

Adequate safeguarding of any system requires a unit so charged that it will correct acid and sediment conditions as well as effect the removal of moisture. Different conditions call for varying kinds of treatment and a wide variety of charges in bulk and cartridge form are available. Studied choice of proper combinations will effectively correct any condition. *Caution*—oil as well as refrigerant takes up moisture and acid, so when recharging with a fresh gas, always change the oil.

Study of actual field conditions as well as laboratory experimentation show the importance of cleanliness in the system. Only by careful planning and exacting workmanship can you hope to reach perfection. Short cut methods are apt to prove costly and nothing should be added to the system for which all the physical and chemical properties are not made known. You are mechanical doctors and like other well-known doctors you want to eliminate the cause and not just treat the effect. Of all liquid anti-freeze and drying agents so far tested, none can be universally used with assured success. In case of extreme emergency, the situation may justify their use, but it should be followed by a change of gas and oil with the application of a combination drier, filter, and neutralizer unit of ample size. Study all conditions and keep complete records of each job. Guesswork results from incomplete records.

From time to time you will have conditions come up that are unusual and puzzling. If you feel that they may be caused by the presence of moisture, dirt, or sediment, get all the data you can with samples of any deposit and send them to our company. If the information is complete enough to enable us to make an analysis we will do so and send you a report of our findings and recommendations. By so doing, you will not only help yourselves, but you will open to the manufacturer a vast laboratory based on actual field conditions.

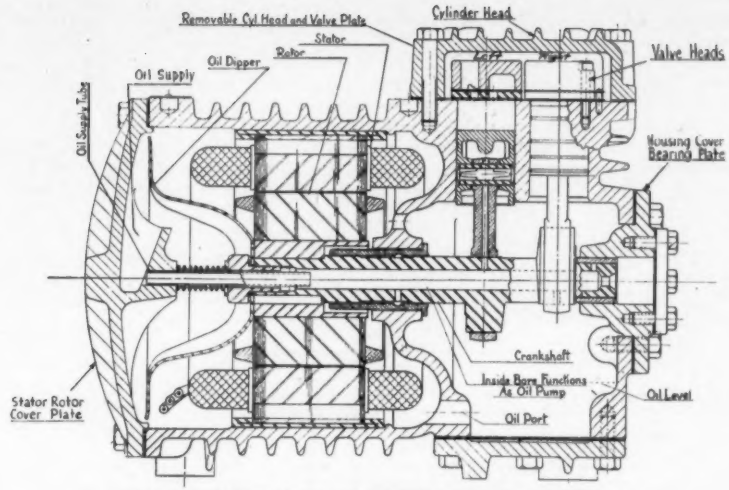
# The New Copelametic Unit

IN the development of the Copelametic units, the Copeland management has established two prerequisites: first, that the principal causes for service be eliminated so far as is practical and possible to attain; second, that the design provide for simple adjustments and parts replacements in the field.

Copelametic units combine the advantages of open and welded-in types. They are completely field serviceable and eliminate belts, seals and manual motor oiling. Removing these three principal causes for service entirely, these units afford the further economy of permitting field adjustment or replacement of any part.

Models are available for self-contained and remote installation from 1/8 h.p. to 1/2 h.p. Single cylinder units are built with 1/8, 1/6, 1/3, and 1/4 h.p. motors. Twin cylinder models have 1/4, 1/3, and 1/2 h.p. motors. The piston stroke is identical in all compressors, but the bore is varied to efficiently load the motor at low, or high back-pressure for each motor size. The refrigerant used is Freon-12 exclusively.

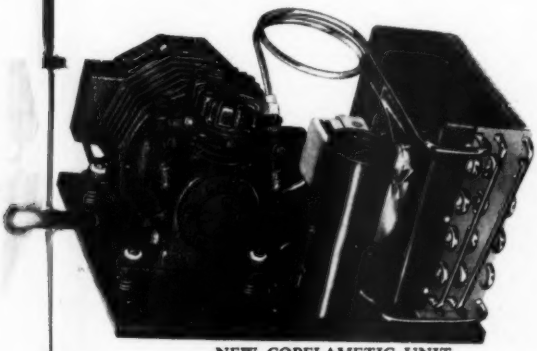
In appearance, the Copelametic compressor itself resembles the conventional reciprocating type. The cylinders, suction and discharge valves, service shut-off valves, gauge connections, oil check openings, etc., are all in the same relative location as on an open unit. This contributes to ease of rendering any service that may be required. The Service Engineer has nothing new to learn about this compressor.




**DIAGRAMMATIC VIEW OF MOTOR-COMPRESSOR UNIT.**

The compressor and motor housing are cast in one piece from close-grained semi-steel so that perfect alignment is assured for bearings and cylinders. Large fins are cast around the motor housing and compressor walls for rapid heat dissipation.

In the usual manner the head may be removed for valve plate inspection, the tongue type constructed discharge valve being on the upper side and a similar constructed suction valve on the lower portion. Each valve plate is held in place by four screws with socket heads to insure against metal chips. Should there be occasion for inspection of the crankshaft and piston connecting rod assembly, these parts may be withdrawn by removing the housing cover.



**NEW COPELAMETIC UNIT.**

To prevent any foreign matter entering the compressor, a fine mesh strainer is used in the suction port of the compressor. A discharge muffler is placed in the discharge port of the compressor.

The compressor has bronze-bushed bearings of generous size, bronze eccentric rods (rifle drilled to the wrist pin), semi-steel pistons with oil grooves and a one-piece Mehanite eccentric shaft—every part machined to extremely close tolerances.

A most outstanding Copelametic feature is the oiling system which provides forced-feed lubrication to all bearing surfaces without the use of an oil pump. A two-blade oil propeller, secured to the eccentric and rotor shaft, dips oil, lifting it to keep filled a reservoir above the shaft center line. From this constant supply, oil is drawn by centrifugal force into openings to bearings along the hollow eccentric shaft. The wrist pins (floating type) are positively oiled through the rifling in the bronze connecting rod.

There is no agitation of oil whatever in the compressor crankcase as the propeller is located at the opposite end of the compressor-motor assembly. Neither is there any violent movement of oil across the motor stator—and there is no flow of refrigerant through the winding. The compressor is of valve-in-head design.

The units are at present built with motors for 110 volt, 60 cycle, single phase current only. Depending on the application, the motor may be capacitor start, induction or

capacitor run—or split phase as used on household units. The motor stator is replaceable in the field and also the rotor, the latter being keyed to the eccentric shaft.

A new condenser is employed on Copelametic units. It is a counter-flow design with flattened tubes and baffled fins. Cooling is accomplished by a separate motor fan which also delivers air over the compressor-motor assembly. The fan motor has a sealed-in oil supply which provides lubrication over a long period of years.

The standard unit receiver is of the hydrogen welded steel type with an integral fusible safety plug.

The compressor-motor assembly is mounted to the unit base on durable springs to absorb vibration. Resilient mounting of the complete unit in a fixture compartment is therefore not essential.

Self-contained type units have pressed steel bases and the remote type cast iron.

In addition to the details above reported, greater economy in operation, smoother, more quiet performance is assured with the new line. The units are designed for use on any kind of application now served by open units—on thermostatic or automatic expansion valves, high or low-side floats and capillary tubes.

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# *Estimating and Selling* (Fourth Article)
# Commercial Refrigeration

**Quick methods of calculating the loads encountered in the bake shop and the fish market are the subjects of discussion in this article.**

By S. C. MONCHER*

COMMERCIAL refrigeration is indispensable to the modern bake shop. Not only does the baker need a place in which to store his perishable raw materials such as butter, eggs, milk, and yeast; but he can decrease his cost of production markedly by using a refrigerator in which to store prepared dough. This is due to the fact that dough can be stored for several days under conditions of 40 degrees temperature —90 percent relative humidity without rising or souring. Consequently, the baker can mix several days' supply of dough at one time, using only what is necessary for his immediate requirements and storing the balance in the refrigerator. This procedure eliminates spoilage of baked goods by permitting closer control between supply and what is needed for daily consumption.

Before dough is placed in the refrigerator, it is usually kneaded into its final form and placed on baking trays, so that the transfer from refrigerator to oven may be accomplished without delay. This fixes the size of the refrigerator around the size of the baking trays. A refrigerator four feet deep is generally suited to this purpose.

In addition to a refrigerator for the storage of dough and raw materials, a bake shop should have a refrigerator for the storage of finished products with cream or custard fillings. This best takes the form of a counter type display case.

SURVEY SHEET FOR BAKE SHOP

| | REACH-IN REFRIGERATOR | DISPLAY CASE |
|---|---|---|
| Size (O. D.) | 10x4x8 high | 6' long |
| Insulation | 3" cork | 2" cork—double glass |
| Maximum store temperature | 110° | 90° |
| Refrigerator temperature | 40° | 45° |

Let us consider an installation in a bake shop containing both a reach-in refrigerator for dough storage and a display case for cake storage.

* Author of Commercial Refrigeration and Comfort Cooling.

**A modern Bake Shop showing a refrigerated display case used for the display of whipped cream filled goods.**
Courtesy of C. V. Hill & Co.

### Load Calculations

(1) *Reach-in Refrigerator.* Exposed surface = 304 square feet.
Temperature difference = 70 degrees.
From table 14, the overall factor is 4.0.
Heat load = 304 × 4.0 × 70 = 85,100 B.t.u per 24 hrs.

(2) *Display Case.* From table 15, the overall factor is 86 B.t.u. per 24 hrs. per lineal foot per degree.
Temperature difference = 45 degrees.
Heat load = 6 × 86 × 45 = 23,200 B.t.u. per 24 hrs.

**TABLE 14—OVERALL HEAT GAIN FOR BAKER'S REACH-IN REFRIGERATOR, EXPRESSED IN B.T.U. PER SQUARE FOOT PER DEGREE PER 24 HOURS.**

| INSULATION | UP TO 200 SQ. FT. | OVER 200 SQ. FT. |
|---|---|---|
| 2 | 4.7 | 4.6 |
| 3 | 4.1 | 4.0 |
| 4 | 3.8 | 3.7 |

Many cities have ordinances prohibiting the sale of baked goods with custard fillings in the summer, unless the shop is equipped with a refrigerator in which these may be stored. Even if ordinances of this type do not exist, the baker should follow this procedure for the protection of his customers.

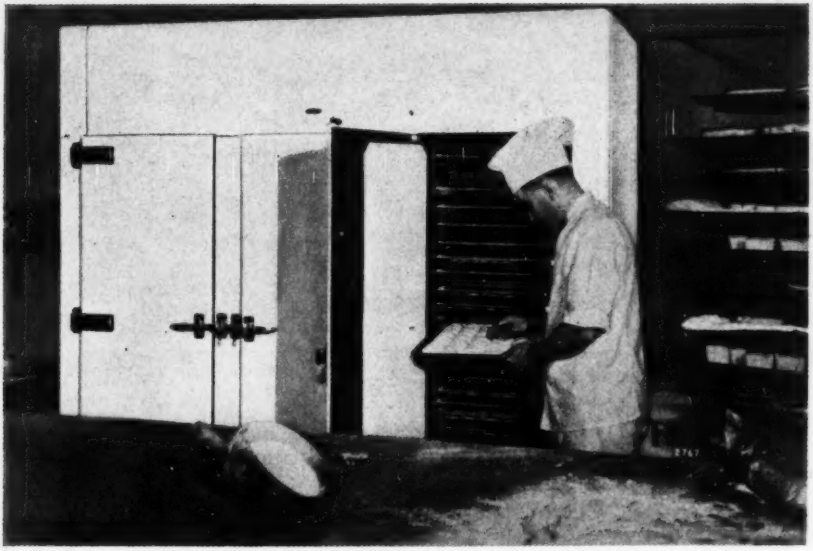
**TABLE 15—OVERALL HEAT GAIN FOR BAKERY DISPLAY CASE (FULL VISION), EXPRESSED IN B.T.U. PER LINEAL FOOT PER DEGREE PER 24 HOURS.**

| | UP TO 10' LONG | OVER 10' LONG |
|---|---|---|
| Double glass ..... | 86 | 82 |
| Triple glass ..... | 74 | 70 |

This means that the sale of a profitable line of products is cut off to the baker for four or five months during the year, unless he provides his shop with a refrigerator. Of course, the same refrigerator will be able to be used to increase the length of time that other products may be stored, thus resulting in a double saving.

### Fish Market

The growth of the fish industry is closely connected with the development of mechanical refrigeration. In commerce, fish are shipped either packed in ice or in the frozen state. To prevent spoilage, it is necessary that these conditions be maintained until the fish is delivered to the consumer. Inasmuch as the ratio of frozen to iced fish in shipment varies with the season, it is of advantage to the retailer to be able to use his storage space for both types. This gives rise to installing equipment capable of main-



**Type of refrigerator used for the storage of dough in the Bake Shop.**
Courtesy of C. V. Hill & Co.

taining both below and above freezing temperatures. In other words, the selection of the equipment must be based upon the most extreme conditions, and a control provided whereby less severe conditions may also be maintained.

The packing of fish in cracked ice is a very effective storage method, for the skins need a moist medium to prevent them from drying out. Under ordinary conditions the maintenance of a constant bed of ice is an expensive procedure. By using a refrigerator cooled to 35° by mechanical means, however, the rate of melting of the cracked ice may be kept to a point where very little new ice need be added. This will represent a constant saving to the fish market owner. In addition, he will be relieved of the bother of continually replacing the melted ice.

The use of freezing temperatures (10 to 20 degrees) is an equally effective storage method. If the fish are to be kept for a long time, this method will prove more economical, and the fish will keep in better condition. We shall consider an installation having two walk-in refrigerators, one reserved for 35-degree storage, the other to be used for either 10 degrees or 35 degrees.

### Survey Sheet for Fish Market

| | (Refrigerator A) 35° refrigerator | (Refrigerator B) 10°-35° refrigerator |
|---|---|---|
| Size | 6x8x10 high | 6x8x10 high |
| Common walls | 8x10 | 8x10 |
| Insulation | 4" cork | 4" cork |
| Maximum store temperature | 85° | 85° |
| Minimum refrigerator temperature | 35° | 35°-10° |
| Temperature of incoming fish | 32° | 32° and 10° |
| Quantity of fish to to be frozen per day | 100 lbs. | 0 |

### Calculations

(1) *Refrigerator A.* Exposed surface = 296 square feet.

**Table 16—Overall Heat Gain for Walk-in Refrigerator for the Storage of Fish Packed in Ice, Expressed in B.t.u. Per Square Foot Per Degree Per 24 Hours.**

| Insulation | Up to 500 Sq. Ft. | 500-1500 Sq. Ft. | Over 1500 Sq. Ft. |
|---|---|---|---|
| 2 | 4.2 | 4.1 | 3.9 |
| 3 | 3.5 | 3.2 | 3.0 |
| 4 | 3.2 | 3.1 | 2.9 |
| 5 | 2.9 | 2.8 | 2.6 |
| 6 | 2.7 | 2.6 | 2.4 |

From table 16, factor is 3.2 B.t.u. per 24 hrs. per square foot per degree.

Temperature difference = 50 degrees.

Heat load = 296 × 3.2 × 50 = 47,500 B.t.u. per 24 hrs.

(2) *Refrigerator B.* Although at times this refrigerator will be used for 35-degree storage, its calculated load must be based on the minimum temperature of 10 degrees required.

Surface exposed to 85 degrees = 296 square feet (surface a).

Temperature difference (a) = 75 degrees.

Surface exposed to 35 degrees = 80 square ft. (surface b).

Temperature difference (b) = 20 degrees.

From table 17, factor is 2.0 B.t.u. per 24 hours per square foot per degree plus 100 B.t.u. per pound of fish frozen per 24 hours.

Heat load (a) = 296 × 2.0 × 75 = 44,500 B.t.u. per 24 hrs.

Heat load (b) = 80 × 2.0 × 20 = 3,200

Total load = 44,500 + 3,200 + 10,000 = 57,000 B.t.u. per 24 hrs.

TABLE 17—NON-PRODUCT HEAT GAIN FOR FISH FREEZER WALK-IN REFRIGERATOR, EXPRESSED IN B.T.U. PER SQUARE FOOT PER DEGREE PER 24 HOURS. ADD 100 B.T.U. FOR EVERY POUND OF FISH FROZEN PER 24 HOURS.

| INSULATION | UP TO 250 SQ. FT. | OVER 250 SQ. FT. |
|---|---|---|
| 4 | 2.1 | 2.0 |
| 5 | 1.9 | 1.8 |
| 6 | 1.8 | 1.7 |

*Sixth Article (concluded)*

# Thermostatically Controlled Expansion Valves

By A. F. HOESEL*

IN concluding this series of articles on thermal expansion valves, it might be well to show the chronological development of the thermal expansion valve. Many of us are inclined to deprecate the efforts of pioneers in any given art without adequately evaluating the various limitations and handicaps under which such pioneers had to operate. We might forget that present day developments are mainly due to the availability of better materials, the increase in general knowledge, and especially the research benefits of large scale production.

Up until about fifteen years ago, the ammonia refrigerating system held sway over the entire field, and when we realize the cumbersomeness of most of these systems we can readily realize that the controls therefor were equally cumbersome, but we cannot dismiss the fact that where the principals involved in such controls are exactly the same as those of today, these pioneers deserve all due credit.

The following material is derived from personal acquaintanceship with many of these pioneers, personal experiences, and a somewhat cursory digest of the patented art. In order to avoid any possible controversy, I shall deal with dates rather than personalities.

As far as I have been able to determine, the first thermal expansion valve appeared about 1897. Crude as it was, nevertheless, it had all of the essentials necessary for thermostatic operation. It indicated that the inventor had a good grasp of the broad principles involved. It might be interesting to know that for the next twenty-five years, or until about 1922, there were practically less valves of this type installed than are now being made daily by the various manufacturers of thermal expansion valves. This is certainly indicative of the vast strides made by the refrigeration industry within less than two decades.

Since refrigeration was an absolute necessity for meat markets and such, the mechanical refrigeration system manufacturers,

* Flow Controls, Inc., Chicago, Ill.

because of the unavailability of reliable controls at that time, generally installed large brine tanks in which the ammonia coils were immersed. The operator would usually start the plant in the morning and then close it down sometime late in the afternoon when the brine temperature was presumably low enough to carry overnight. On a Sunday, it was generally necessary for him to start the plant again and leave it operating for several hours before closing it down.

### Direct Expansion Introduced

As more reliable thermostats became available, the newer installations dispensed with the brine tanks and used direct expansion piping with suitable bunkers for the convection circulation of the air. It was no longer necessary for the operator to give constant personal attention to these refrigerating systems, but periodically it became necessary to defrost these pipe coils, because the necessary temperatures could no longer be maintained on account of the frost formation on the pipes, which acted as an insulator. The operator had two choices. One was to open the door and let the temperature rise sufficiently to melt the frost from the pipes. The other was to manually chop the frost off. Neither of these methods was desirable.

About 1922, another inventor devised a system using, among other things, a thermostatically regulated refrigerant feed to the pipe coils in order to get maximum heat transfer efficiency. On top of this, due to his particular system which was rather complicated and very expensive, it was possible to successfully hot gas defrost the cooling pipes. This system enjoyed a comparatively wide application for a number of years, and its inventor was, to my knowledge, the first to use in a rather limited manner an insulation to nullify the effects of the low temperature of the expanded refrigerant upon the thermostatic charge. This principle was later more effectively used in several makes of thermal expansion valves utilizing bakelite housing spacers to separate the power element bellows from the pressure bellows.

About 1925 another inventor developed a system of interchangeable outlet orifices whereby the capacity of a given valve could be suited to the particular cooling unit to which it was connected. Since used with ammonia at that time, it served the dual purpose of preventing valve seat erosion and the congealing of oil at the valve seat.

During 1925-26 there was developed a thermostatically controlled ammonia expansion valve which really incorporated many features which are generally presumed to be much more recent. This valve used methyl chloride as the thermostatic fluid, and was the first to employ a thermostatic fluid other than the fluid used in the refrigerating system proper.

Due to the proper proportioning of the power bellows area to the pressure bellows area, this valve had a constant superheat operation between all stages of operation from high temperature to low temperature. It had a gas-charged power element, and was also adjustable, similar to an automatic expansion valve, whereby the refrigerant feed could be cut off at pressures even less than that due to the pressure of the gas charge. It might be pertinent to state that the gas charging of this valve was entirely due to the unreliability of comparatively large diameter bellows manufactured at that time. The power element was thoroughly insulated from the low temperature effects of the valve body proper by means of bakelite spacers and a hydraulic oil transmission.

Because of its expensiveness, the application of this valve was rather limited, but it did have many of the more recent features.

In the early part of 1929 a certain inventor utilized the heat of the incoming refrigerant liquid, in order to maintain the power element at a sufficiently elevated temperature so that the thermal control was at all times under the influence of the feeler bulb temperature. Early valves of this type were not universally successful, since the principle was not as effectively employed as in the later types.

About this time (1929) the use of fin coils began to spread, and from that time on, the low pressure refrigerants system came into its own. No longer was there any necessity for manual defrosting of moderate temperature jobs, such as butcher shops, etc.

While fin coils, per se, were in common usage in European countries long before their domestic application, it was very fortunate that their usage here was accompanied by enough heat transfer surface to insure their defrosting during the compressor shut-down period on normal temperature applications.

Among all the factors contributing to the present day wide application of mechanical refrigeration, there are, to my mind, three which have made a major contribution. They are the stuffing box seal, the fin coil, and the thermal expansion valve.

# Service Engineers Install Novel Ice Rink

*By* ROBERT LATIMER

A NOTABLE instance in which the advice of a refrigeration service engineer saved a client a great deal of installation and operation cost is the beautiful new ice-skating rink installed by Frigid Refrigeration Service Company of New Orleans, authorized Westinghouse service and commercial installation firm. The job mentioned is a huge ice-making refrigeration system installed by George W. Mims, president and engineer of the company, for an amusement association in the Louisiana metropolis.

Two major problems confronted Mr. Mims in designing the refrigerating system —first, it was to contend with the hottest weather of the year (most use in June, July and August) and second, it had to be sufficiently versatile in operation that it could be easily removed for making room for other activity. Both were solved in the present installation, which has been cited as a glittering example of progress in large scale refrigeration engineering.

The skating rink, which was built in midsummer, has two outstanding points which attracted unusual attention—first, it was completely fabricated and installed in a little more than three days by a crew of six men working night and day to meet the scheduled opening of the season, and second, it is the largest such refrigeration plant using only Freon refrigerant in the nation—in fact, the only all-Freon installation of its type. Costs of brine system, pumps, tanks, frequent coil cleaning and piping from an outside cooling house were

The bed of 29,120 feet of ⅜-inch copper tubing. Note 2x4 supports on pan floor. Tubes were filled in with soft sand, then flooded with water to a depth of three inches. When complete, the rink ice is painted red, white, yellow and blue, to form a huge star for a colorful skating background.

all eliminated by the substitution of Freon refrigerant to handle the entire cooling load. Moreover, the system, first to be installed by a refrigeration service firm exclusively, requires no assistance to keep up a perfect floor of ice.

Measuring 120 feet long by 61 feet wide, the rink was installed in the New Orleans public auditorium, and contains 29,120 feet of 5/8-inch copper tubing connected to two 60-ton Westinghouse compressors located in the basement and feeding directly to the coils. The copper tubing was fashioned in the Mims plant in sections of eight widths, and connected as rapidly as trucks could bring it to the auditorium.

Using 1160 pounds of Freon circulated through the coils, the system has escaped the frequent repairs and operation difficulties of brine completely. Three inches of ice, 1 5/8 inches of which is over the top of the tubing, is formed quickly. So efficient did it prove that a total of 24 hours only was required from the time the tubing was flooded until a perfect surface of ice was formed for the first evening's show, when "Ice Capades", a commercial skating troupe, dedicated the new rink. Thus only 4½ days from the beginning of the installation, the ice-making system was operating at full efficiency.

No help is needed from the building air conditioning system to provide a perfect ice surface, according to Mr. Mims. Sufficient power is provided in the 120 tons of cooling equipment to operate the system efficiently during the hottest weather in the year. It was during New Orleans' hottest weather that the first sheet of ice was frozen.

Thirty Alco valve expansion valves are used along the right side of the rink for control, protected from damage by a metal housing which also serves as a bench for skaters. There is another Alco by-pass valve on the compressors, which, however, has never been needed, due to the efficiency of the system. Repairs, in the case of leaks, mean that only two square feet of ice must be removed instead of the 20 square feet with standard brine systems. This is an important feature insisted upon by W. W. Taylor, consulting engineer, who inspected 5,505 joints in the tubing and found only eight small leaks, which were repaired during the first hour the tubes went into action. All tubing is strapped to wooden bars across the floor, with copper clamps and nailed straps securing each.

When not in use the refrigerating system can be removed in sections and stored in a convenient room until needed again. Its total cost was $16,000 as against a probable $35,000 cost for a similar brine system, with material savings represented each month of use. The city of New Orleans purchased the entire equipment on November 8th, and will operate it henceforth.

Most interesting point, according to Mr. Mims, is the fact that ten 20-foot lengths of tubing were laid down, clamped, and both ends cleaned for return bends in every five minutes of the three-day installation period.

# An Early Isko Compressor

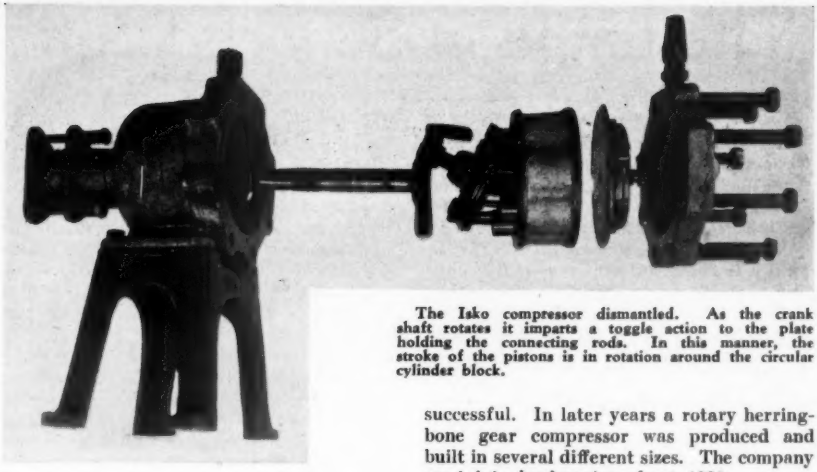
INTERESTING from the standpoint that it reveals some of the earliest efforts in designing household refrigerating units is the Isko compressor pictured in Figs. 1 and 2.

The compressor is an eight-cylinder reciprocating rotating piston type. Each cylinder has a one-inch bore and a 17/16-inch stroke. A ½-h.p. motor was required to drive it at a speed of about 350 r.p.m. Sulphur dioxide was the refrigerant used, and about 400 of them were manufactured in 1916. A stuffing box was used to seal the shaft against leaks, and three round leather belts were used as the drive.

According to R. M. Coyle, Gridley Electrical Service, Gridley, Illinois, who dismantled the machine, it was installed on the top of a Bohn wooden box of about eight or ten cubic feet capacity. It has been in service until recent years. The condenser was made up of ½-inch copper tubing wrapped around the entire unit and having the appearance of a bird cage.

The evaporator was of intricately wound tubing with plenty of solder to hold it together.

An expansion valve of unknown make and design fed the evaporator with refrigerant. A magnetic type temperature control with

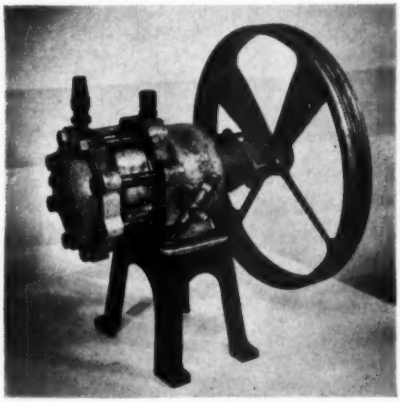


The Isko compressor dismantled. As the crank shaft rotates it imparts a toggle action to the plate holding the connecting rods. In this manner, the stroke of the pistons is in rotation around the circular cylinder block.

a U arm extending through the box controlled the cycling of the unit.

The unit was very expensive to operate and very slow in pulling down the box temperature.

According to such history as can be obtained, the company which designed it was the Mechanical Refrigeration Company of Chicago. Work was begun on designs for household units about 1912. About 1916, the company was purchased by Isko Inc. and moved to Detroit where this compressor was produced. In those early days Isko Inc. also produced a single-cylinder and a twin-cylinder compressor, both of which were unsuccessful. In later years a rotary herring-bone gear compressor was produced and built in several different sizes. The company went into bankruptcy about 1920.



Isko Compressor manufactured about 1916.

## CORRECTION

IN the article entitled "The Kinks in Low Temperature Refrigeration" contained in the December issue of this journal, an error in the size of a fitting was made.

On page 40 of the issue under the subheading "Making a Cleaning Fitting," it was stated, "In this cap, drill a hole and tap it out for ¼ inch I.P.T." This should read, "tap it out for ½ inch I.P.T."

Excuse it please.

G. H. Gifford
Ohio

I find THE REFRIGERATION SERVICE ENGINEER a very valuable source of information. Our best wishes to you for a continued success.

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Jack Moore
Washington

I think there is no publication like THE REFRIGERATION SERVICE ENGINEER.

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John J. O'Brien,
Washington.

In answer to your invoices for payment past due you. (Never to be beaten magazine) inclosed find $2.00 for renewal. I thank you very much for sending the journal to me as I was out in the country on R.E.A. electric work and did not have time to clean up any mail that came in.

# The Lathe in Service Work

*Most of the information and all the illustrations in this article were supplied by the South Bend Lathe Works of South Bend, Indiana, and it is to them we give credit for this interesting, well-illustrated article. Much of the lathe work required in refrigeration service is similar to that required in automobile repair work; therefore, the methods outlined here have been developed from years of experience in the automobile service industry.—Editor.*

IN a great many service shops doing refrigeration repair work, the equipment is limited to a bench, a vise and a set of hand tools which are used both in field and shop. If the shop is located within easy reach of a source of supplies for parts, a machine shop, a motor repair shop, and other such conveniences, and providing the service shop operates on the basis of selling and exchanging new parts instead of repairing the original, it will get along quite nicely. If, however, all these things are not available, a lathe in the shop will be found indispensable. Even in the case of the first-mentioned shop, its owner will be passing up a lot of profitable business by not having a lathe, thereby being unable to make many of his own repairs instead of jobbing them out.

Owning a lathe, however, is of little value unless you know how to use it to its best advantage, and that is the purpose of this article. Any repair part in the service shop requiring resurfacing, truing, drilling, grinding, milling, facing or almost any machining of any kind, can be done with a lathe. There are attachments available for nearly every specialized job, and with a knowledge of how to use them, the lathe can become for you the truly universal machine.

Among the most frequent jobs for the lathe encountered in the service shop are the truing of commutators, grinding and truing seal seats and seals, grinding valve plates, truing and renewing crack shafts, boring rebabbitted connecting rods, fitting new pistons, reboring and rehoning cylinders, making bushings and bearings, winding springs and making many replacement parts which are difficult to obtain or are out of manufacture. How to do some of these jobs will be described in the following.

The picture on the front cover shows Fred Wiedenhoeft, service engineer, in the service shop of the Light Company, Inc., South Bend, Indiana, truing a commutator of a motor armature. This is probably the most common use for a lathe in the service shop. The lathe being used is the 9-inch South Bend bench lathe.

After an armature has been in service for

**Fig. 1—A commutator being machined between centers of the lathe.**
**Fig. 2—Using a self centering chuck and a self centering support bushing to hold the shaft of a commutator while being machined.**

sometime, the commutator becomes worn and the mica insulation projects above the copper segments because the mica is harder than the copper. This prevents a good contact between the brushes and the commutator, and causes arcing and burning of the copper segments. When the surface of the commutator has become worn so that it is no longer smooth and round, the only remedy is to machine the surface of the commutator true in the lathe. This will restore the original smoothness and accuracy of the commutator surface, so that the commutator will be as good as new. Perfect contact is then assured between the brushes and the surface of the commutator.

It is very important that the commutator be machined perfectly true and concentric with the shaft. If the commutator is not true, it will throw the armature off balance so that there will be vibration, and it will also prevent the brushes from making a good contact with the commutator when the commutator is revolving at high speed.

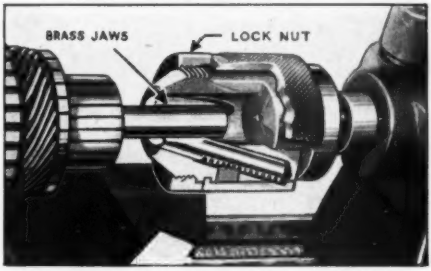



**Fig. 3—Adjustable support bushing used in tailstock of lathe for supporting armature shaft.**

Most armatures on refrigerator motors are equipped with center holes in the shaft, and the commutators should be mounted as shown in Fig. 1. This is the easiest method of mounting and requires the least time. Some armatures, such as Delco, do not have center holes in the shafts, and it then becomes necessary to machine center holes in the shaft before the work is done. This is accomplished by gripping one end of the shaft in the self-centering chuck mounted on the spindle of the head stock, while the other end rests in a steady rest. A special centering drill is held in a drill chuck mounted in the tail stock, and drilling is begun.

The other alternative in the case of centerless shafts is to mount it in the lathe as shown in Fig. 2. The left end of the armature shaft is gripped in the chuck which automatically centers the shaft with the bearing surface, and at the same time acts as a driver. A ¾-inch drill chuck is shown in the illustration, but any type of chuck having the necessary accuracy may be used.

A special adjustable support bushing, shown in Fig. 3, is used in the tail stock of the lathe for supporting the right end of the armature shaft. This support has three brass jaws which are adjusted simultaneously to center the shaft and may be locked into position by tightening the lock nut. The jaws should be just tight enough to provide a good running fit on the shaft. The shaft should turn freely in the jaws, but there should be no play.

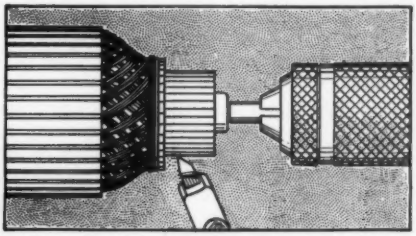


**Fig. 4—Top view of cutter bit showing position when truing commutators.**

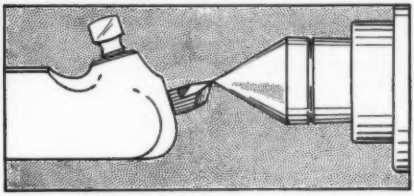


**Fig. 5—Set cutting edge of tool exactly on center for truing commutators.**

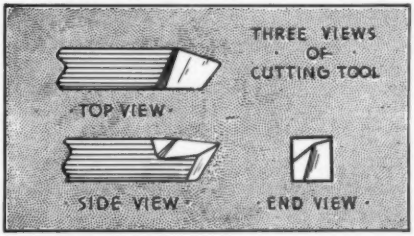



**Fig. 6—Detail of tool ground for truing commutator.**

Before starting the lathe, a few drops of oil should be placed on the shaft where it revolves in the jaws of the special chuck mounted in the tail stock spindle of the lathe. This will prevent the jaws of the chuck from wearing, and will also avoid

possible scoring of the shaft. The method outlined in the foregoing permits mounting all types of centerless armature shafts in the lathe, and may also be used for mounting armatures which have center holes in the ends of the shaft. It is not advisable to machine the commutator with the armature mounted on centers because the center holes in the armature shaft are seldom true and concentric with the bearing, and they are often damaged in removing the armature.

The lathe should be arranged to operate at spindle speed, between 300 and 400 r.p.m., for truing armature commutators. This is a moderate speed and can usually be obtained by disengaging the back gears and placing the belt on the middle step of the cone pulley. The power longitudinal feed should be used to obtain smooth finish on the surface of the commutator.

Figs. 4 and 5 show an excellent type cutter bit for truing armature commutators. The shape of the cutter bit permits truing the commutator to a square shoulder. The cutting edge of the cutter bit should be set exactly on center, as shown in Fig. 5. This is to prevent the cutter bit from digging in and chattering. After grinding the cutter bit to the shape shown in Fig. 6, the cutting edge should be carefully honed with an oil stone. If the cutter bit is properly sharpened and honed to a keen edge, an exceptionally smooth finish can be obtained.

### Truing the Commutator of a Delco Motor

Some Delco motors have a commutator that is a little more difficult to true than the commutators of most motors. This is because the commutator is inside of the armature next to the shaft. Most of these armatures do not have center holes in the ends of the shaft, which necessitates the use of chucks in the head stock and tail stock spindles of the lathe, or the machining of center holes in the shaft before the work can be begun. A forged boring tool, such as is illustrated in Fig. 7, is necessary for machining the commutator. The boring tool must be bent so that the cutting point will reach inside of the armature.

The commutators of motors using brushes during the starting period only are not usually undercut. On DC motors, however, and on AC motors, running on brushes all the time, it is often necessary to undercut them. The mica undercutting attachment, shown in Fig. 8, is used for undercutting the commutator. The undercutter saw blades are made in standard thicknesses to conform

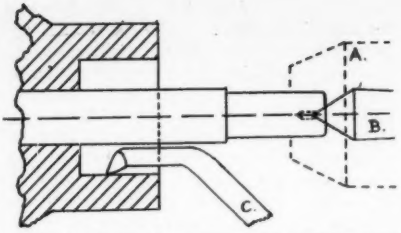



Fig. 7—Truing the commutator of a Delco motor used on Frigidaire units. A—shows the adjustable support bushing being used where no center hole is drilled in shaft. B—Use steady rest to drill center hole in armature shaft and use tail stock center to support shaft. C—Bent Boring tool for truing commutator.

to the width of the mica insulation. Short pieces of ordinary hack saw blades may be used for undercutter blades if desired.

After undercutting the surface of the commutator, it should be polished with very fine sand paper.

### Truing Refrigerator Crankshafts

The main bearings of a refrigerator crankshaft can be refinished by mounting the crankshaft between the lathe centers. If the crankshaft is hardened, it will be necessary to use a grinding wheel in the tool posts, in place of the cutting tool of the lathe. However, if the crankshaft is not hardened, the bearing surfaces may be remachined with the lathe tool, then polished with fine emery cloth and crocus cloth.

The throw bearing of the crankshaft can be machined by mounting the crankshaft in offset center blocks, as shown in Fig. 9. The throw bearing may be refinished either by turning and polishing, or by grinding. The grinding wheel recommended is Grade 80 Grain I..

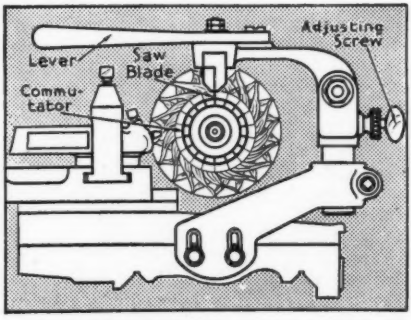



Fig. 8—Mica undercutting attachment being used on the commutator.

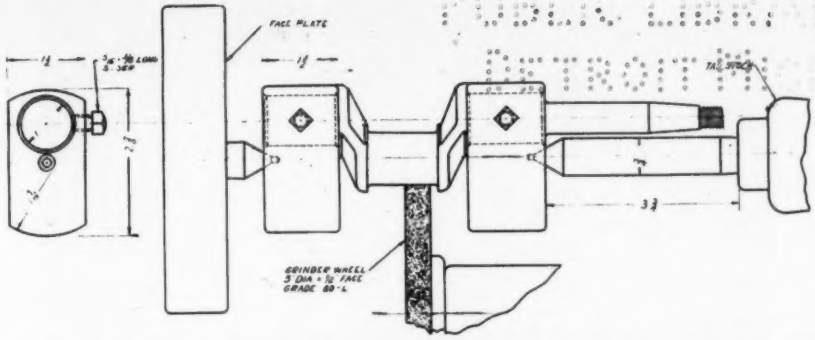



Fig. 9—Using offset center blocks to grind the throw bearing of a crankshaft between centers on the lathe. The shaft and offset blocks shown here are for a Kelvinator compressor.

When refinishing refrigerator crankshafts, remove only the amount of stock necessary to produce a good smooth finish. Take very light cuts and do not reduce the diameter of the bearing any more than is necessary.

### Grinding the Face of a Refrigerator Compressor Seal

For this operation, it is essential that the cross slide of the lathe be perfectly square with the head stock spindle of the lathe. It is also important that the correct grade of grinding wheel be used, so that a very smooth finish can be obtained. The grit size of the wheel should be from 120 to 150. This type of wheel will not remove much stock, but will produce a very good polish and smooth surface. When the seal is in poor condition and .002 or .003 inches must be removed to produce a smooth surface, a coarser wheel should be used for rough grinding before the fine wheel is used for finish grinding. A Grain 80 Grade L wheel may be used for rough grinding.

If this work is properly done on a precision lathe that has been correctly installed and leveled, a gas tight seal may easily be obtained with very little or no hand lapping. The seal may be held in the lathe with special collets, as shown in Fig. 10, or with either a three-jaw universal chuck or a four-jawed chuck.

Fig. 11 shows the refinishing of a crankshaft seal seat, using a grinding wheel of the same grit size as is used when grinding the seal face. The shaft is usually mounted between centers for this operation. High and low side float valve needles, hand operated valve stems, and other such devices can be

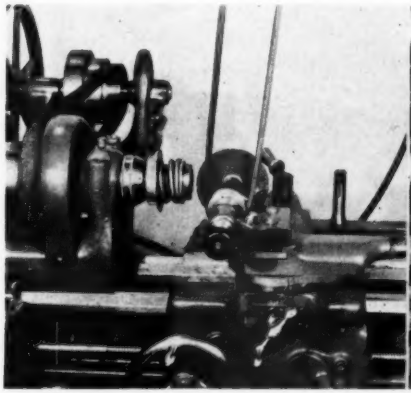


Fig. 10—Truing the face of a compressor seal.

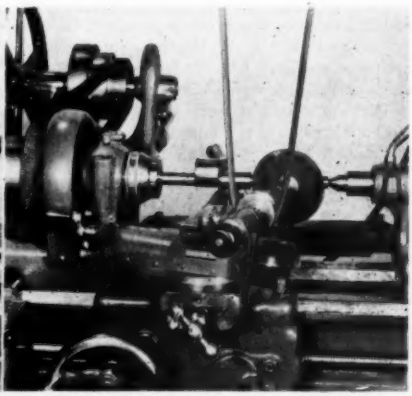


Fig. 11—Refacing the seal seat on a compressor shaft.

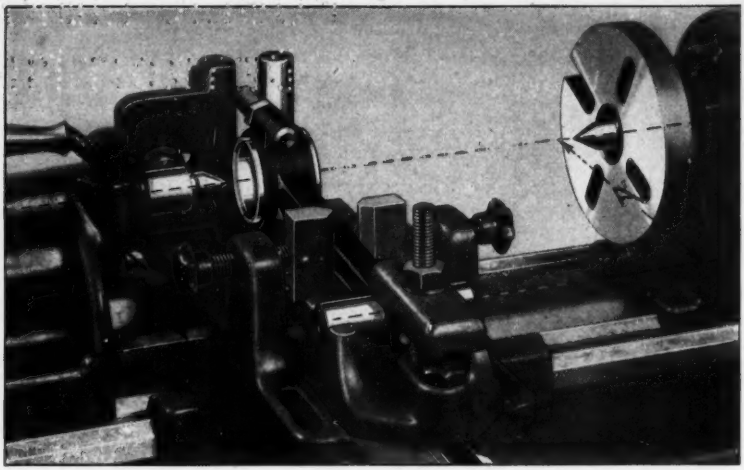


Fig. 12—Connecting rod boring attachment mounted on lathe for holding and aligning connecting rod.

trued and refinished with the same setup shown in Fig. 10 and 11.

### Boring Rebabbitted Connecting Rods

A special fixture known as the connecting rod boring attachment is mounted on the lathe carriage, as shown in Fig. 12, for boring rebabbitted connecting rods. This is a universal attachment having adjustable stops, which permit mounting various sizes and types of connecting rods. A finished surface along the left edge of the attachment is provided for aligning it with the face plate of the lathe.

The connecting rod is aligned with the lathe centers by an adjustable V-block, in which the piston pin is clamped. The opposite end of the connecting rod is held securely on both sides of the rebabbitted bearing by adjustable clamps which are so constructed that they may be tightened without springing the connecting rod out of alignment. These clamps should be carefully adjusted and tightened after the piston pin is clamped on the V-block.

A centering cone is mounted between the lathe centers, as shown in Fig. 13, to aid in centering the connecting rod bearing, either before or after it is babbitted. The connecting rod should be clamped loosely in the connecting rod boring attachment until the bearing is properly centered, after which the clamps may be tightened. The cross feed screw of the lathe and the vertical adjusting screw of the connecting rod boring attachment are adjusted simultaneously to align the bearing with the spindle centers of the lathe. After the connecting rod has been aligned, the compound rest base should be locked by tightening the dovetail gib screws.

### How to Bore the Bearing to Exact Size

A boring bar is mounted between the lathe centers, as shown in Fig. 14, for boring the connecting rod bearing and for finishing the ends of the bearing. It is advisable to use

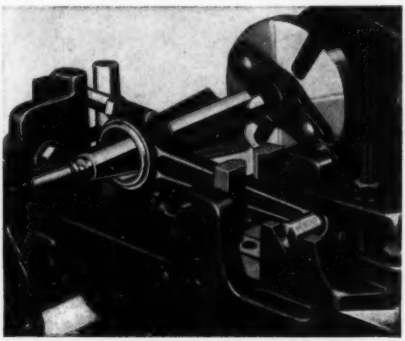


Fig. 13—Aligning connecting rod bearing with centering cone between centers.

a set of two boring bars, one with the cutter bit set for the roughing cut, and the other with the cutter bit set for the finishing cut. This permits finishing a complete set of con-

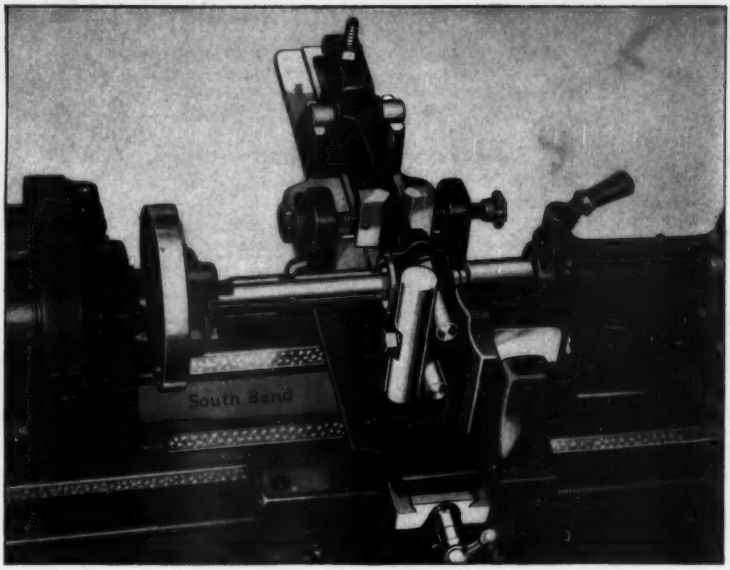



Fig. 14—Boring a re-babbitted connecting rod in the lathe.

necting rods (or more) without changing the adjustment of the cutter bits.

The cutting edge of the cutter bit should be honed to a keen edge with a small oil stone in order to obtain a smooth, bright finish. High speed steel cutter bits may be used with excellent results, although in some shops where a great deal of connecting rod boring is done a diamond lapped tungsten-carbide tipped cutter bit is used for the finish boring operation.

The ends of the connecting rod bearing may be faced, trimmed and chamfered to the exact length required by using micrometer carriage stops on each side of the lathe carriage. The stops may be adjusted for any length of bearing. After the stops have been properly set, any number of bearings can be faced to the same length without making additional measurements. A cutter inserted in the boring bar is used for machining the ends of the bearings. The lathe spindle should revolve slowly for this operation. The boring bars are reversible so that after one end of the bearing has been faced, the bar may be turned end for end and the opposite end of the bearing machined. In addition to the cutter for facing the ends of the bearing, each boring bar also carries a boring cutter. This saves time

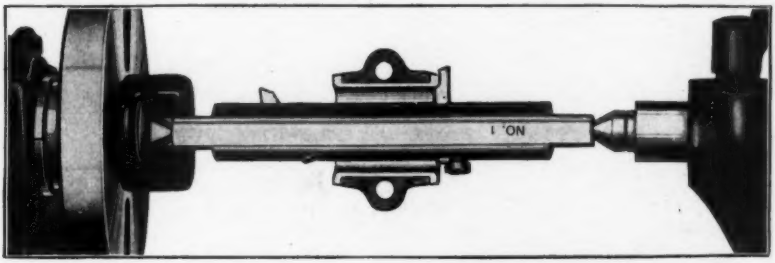


Fig. 15—Facing and rounding the end of a connecting rod bearing.

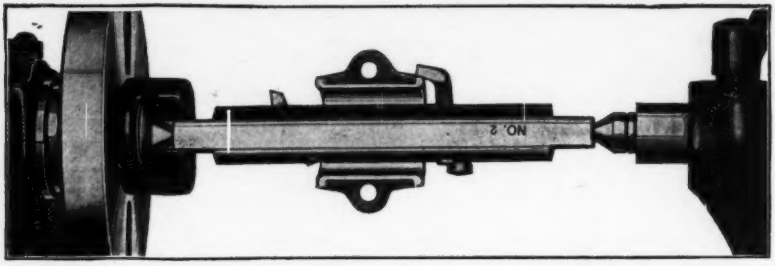


Fig. 16—(Above) Trimming the end of the bearing with boring bar mounted between centers.

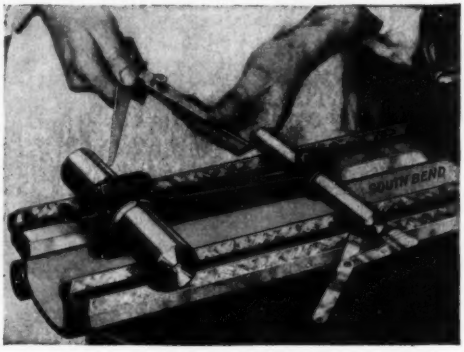
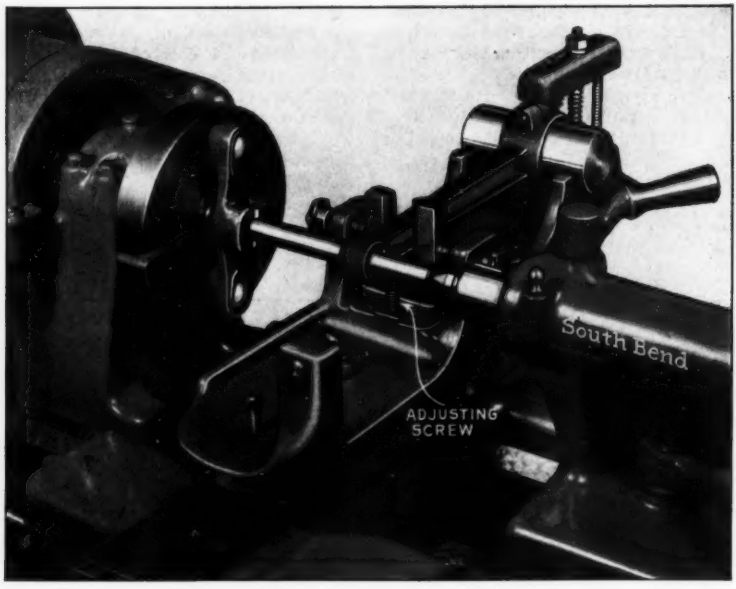


Fig. 17—(Right) Testing connecting rod for alignment and twist, using test bars across V-ways of lathe bed.

Fig. 18—(Bottom) Line boring piston pin bushings in connecting rod.



as it permits boring the bearing and facing the end at one setting. (See Fig. 15.)

If the lathe is not equipped with micrometer carriage stops, it is advisable to use micrometer calipers in checking the length of the bearing. Care should be taken to remove an equal amount of stock from each end of the bearing.

A bent cutter mounted in the boring bar is used for trimming the ends of the bearings. This cutter may be adjusted for various diameters of bearings and may be ground to form any desired angle. The lathe spindle should be operated at a slow speed for this operation. (See Fig. 16.) After one end of the bearing has been trimmed, the boring bar should be turned end for end and the opposite end of the bearing trimmed.

### How to Test Alignment of Bearings

The lathe bed may be used, as shown in Fig. 17, for testing the twist and accuracy of alignment of connecting rod bearings. To test the connecting rod bearings for twist, test bars are inserted in the piston pin bearing and crankshaft bearing, and the entire assembly placed on top of the lathe bed so that the ends of the test bars rest across the tops of the V-ways. If there is any twist in the connecting rod, the ends of the bars will rest unevenly on the V-ways. The amount of twist can be determined by measuring with a feeler gauge between the end of the test bar and the V-way of the lathe bed. The connecting rod should be removed to a vise for straightening if it proves to be bent. To test the connecting rod bearings for alignment, measure between the test bars at each end with inside calipers, as shown in Fig. 17. If there is any misalignment of the bearings it can easily be detected and the connecting rod may be straightened in a vise.

### Line Boring Piston Pin Bushing in Connecting Rod

When new piston pins are installed, the piston pin bushing must be bored in perfect alignment with the crankshaft bearing in the connecting rod, because the slightest misalignment will cause the piston to bind in the cylinder and make satisfactory operation of the compressor impossible. It is difficult, if not impossible, to hand ream or hone the bushing in perfect alignment, so in many shops connecting rods are twisted in a vise after reaming in order to bring the holes into alignment. This is not recommended as it requires much time, and the strains set up by twisting may cause the rod to warp out of shape in service.

The piston pin bushing can easily be bored in perfect alignment with the crankshaft bearing, as shown in Fig. 18. A small boring bar is placed between the lathe centers, and the rod is mounted in the connecting rod boring attachment, much the same as for boring the crankshaft bearing. The large V-block aligns the connecting rod with the boring bar in the lathe. No special fixture other than the connecting rod boring attachment is required on 13-inch and larger lathes, but on the 9-inch and 11-inch lathes an extra large V-block is needed.

Boring the piston pin bushing will produce a round, straight hole and is more reliable than reaming, as a reamer will crowd over and follow any inaccuracy that may exist in the original hole.

S S S

## FREEZE FOOD WHEN PRIME

WHOLE celery, lettuce, citrus fruits, cucumbers and tomatoes are five popular products that are not well adapted to freezing preservation and storage in lockers, under present conditions, says J. L. Heid of the U. S. Department of Agriculture who is working out the best methods of processing fruits and vegetables grown in the lower Rio Grande Valley by the Texas Agricultural Experiment Station.

Citrus and tomato juices may be frozen for storage, as may desirable varieties of apricots, berries, figs, nectarines, cherries, peaches, plums, asparagus, broccoli, brussels sprouts, cauliflower, corn, snap beans, lima beans, peas, squash, and greens. The Texas experiments have emphasized, however, that there are wide differences in the desirability of varieties of fruits and vegetables. Good shipping varieties and other varieties particularly suitable for canning may not prove at all suitable for freezing. Fruits and vegetable for freezing, says Heid, should usually be harvested at the stage when they are in the best condition for immediate table use, and should be processed quickly.

S S S

Mr. Ellsworth F. Cassing,
Missouri.

I go home only every month or so and hence the delay . . . anyway, enclosed find in cold cash the tidy little bit of $2.00, and by all means keep my research library coming, namely, THE REFRIGERATION SERVICE ENGINEER.

# The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

## CROSLEY SERVICE

QUESTION 415: I would like any information you can give me on the Crosley household refrigerator model 8602. It is a capillary tube unit with a small single cylinder compressor and no receiver.

When I went to service it the first time, the unit was jumping so much it would strike the cabinet. The belts were worn and I replaced them and purged the unit after checking for leaks and leaking seal. This helped quite a bit, but it ran too much, and I figured it had a leaking head valve, so I replaced the valve plate. I found out the service valves do not work the same as most valves, and probably was wrong in my test for a leaking head valve.

When I left it today, the head pressure was quite high, between 110 and 115, and there was quite a bubbling sound in the evaporator. Is this common with this type unit? I added a little gas ($SO_2$), and as the head pressure was still high, purged it again, which did not bring it down. Is it possible the capillary tube is partly restricted and should be replaced?

ANSWER: An overcharge of oil will cause this trouble. The oil charge in these jobs is very critical and should an extra amount of oil be added at any time, the oil has a tendency to slug over and log the capillary tube. The head pressure of 110 to 115 pounds is definitely high. As you know, the head pressure on an $SO_2$ model of this type should not be higher than 10 pounds over that figure representing the room temperature. It is also possible that the capillary tube is partly restricted and should be replaced.

### Refrigerant and Oil Charge

The refrigerant charge is 33 ounces for this job. The compressor takes 10 ounces of oil. Oil that may have been pumped into the evaporator must be driven back to compressor, by overcharging gas before oil level is checked.

## NORGE FLOAT DEFECTIVE

QUESTION 416: I have been servicing a Norge, about a '31 model 6 cu. ft. box. I had to replace most all of the parts, receiver, needle valve, tubing, and seal. I am running into trouble which I cannot seem to solve.

I have had the evaporator completely frosted, but lacked sufficient $SO_2$. I shut the box down and started it the next night, but could not get any frost or any cooling, although I was also pulling a vacuum. After a short time of running, it suddenly ran a back pressure at between 60 and 70 pounds of pressure, which was as far as my gauge would register. I immediately shut off my receiver service valve and drew the $SO_2$ into the receiver with no trouble. After testing for obstructions and finding none and assembling, I opened my receiver valve and ran the liquid into the evaporator. I started the compressor, kept a vacuum of about 3 inches for about 5 minutes, then suddenly I again had a back pressure as before. The motor and rollator get very hot.

Is my trouble in the check valve? To my knowledge, it seems to be all right, and I can bring the $SO_2$ all the way around while working back and forth with the receiver service valve.

ANSWER: From the description you have given me, I feel sure that your trouble is due to something within the lowside float, combined with a second trouble, which is a slight shortage of gas. It is probable that the float needle is leaking, or more probable still, that the float ball has sprung a leak so that it fills with refrigerant within a few minutes after the system is placed in operation.

The fact that you are able to pump a vacuum on the entire system and pump the entire charge over into the highside indicates that there is nothing wrong with the compressor or the check valves. It is apparent, however, that for some reason, the float needle does not hold, and the float chamber is

permitted to fill up with refrigerant until all the liquid refrigerant in the highside has passed over to the lowside, permitting high pressure gas to pass into the lowside and giving you the high pressure reading on your lowside gauge.

I'm sure if you will dismantle this evaporator coil and float, you will find your trouble located there.

## CROSLEY SERVICE TROUBLE

QUESTION 417: Recently I was called in to service a six-year-old Crosley hermetic unit. It ran all the time. The unit was charged with Dichloromonofluoromethane. In checking pressures I found the head pressure to be 60 pounds during operation and about 35 pounds at the end of the off cycle. I purged the condenser so that at the end of the off cycle the head pressure, which should be 15.8 pounds at 86 degrees, read about 20 pounds at 90 degrees room temperature. That is, as far as I know, right for this refrigerant.

However, in order to get a back pressure to correspond to 5 degrees evaporator refrigerant temperature, I should get 18.8 inches. I could only get 13 inches. My conclusion was that the compressor was worn, but I couldn't check this because the C.S.S.V. is so constructed that when front-seated, it shuts the suction line to the compressor and leaves the gauge connected in with the suction pressure of the evaporator. Am I right in my diagnosis?

There is plenty of refrigerant in the system as the entire evaporator frosts nicely. The machine runs quite a bit as yet, but does operate much more nearly normal than it did.

I also find a head pressure of 120 pounds in a newer model Crosley machine charged with $SO_2$. Should the head pressure be that high? The machine is a capillary tube type and the condenser is small. However, the condenser is clean and there is plenty of ventilation around it. I thought perhaps the high pressure might be characteristic of that machine, since there doesn't appear to be any air in the system. The "choke" tube is not restricted or clogged. The back pressure was 8 inches.

ANSWER: I believe you are getting about the maximum operation out of this unit. If the evaporator will hold a temperature of 10 degrees to 15 degrees, the machine cycles satisfactorily and will hold a cabinet temperature of about 40 degrees, I don't believe there is any reason to worry about it any further.

With regard to the other Crosley machine on which you have found the head pressure 120 pounds, this is certainly far above normal and the machine should not operate on a pressure higher than 90 to 95 pounds. There are two possibilities which may be the cause of this high head pressure; one, that of air in the system, which, of course, can be easily purged off. Another is an overcharge of oil in the system, or a displacement of the oil.

Those machines operating with a capillary tube are quite easily affected by an overcharge of oil, or by oil displacement, due to the fact that oil does not travel through the capillary tube at a very fast rate, and it creates a condition much the same as a partly clogged capillary tube. The oil, of course, will pass through very slowly, but it permits more liquid refrigerant to be held in the highside than is normal. I would suggest that you purge this machine thoroughly to be sure that no air is left in it, then add refrigerant to the lowside of the compressor until the return line shows the system to be overcharged. Allow it to operate in this manner for a period of about a day or two days, so that the oil throughout the system may be driven back to the compressor.

The compressor then can be checked for the proper oil level, and if it is found to contain more than its normal amount, some oil can be removed. The amount of refrigerant then can be balanced in the usual manner for such systems.

## COMPRESSOR BURNS BELTS

QUESTION 418: Will you please explain to me how to determine the correct head pressure on a water-cooled Frigidaire condensing unit? The only discharge valve is located on top of the condenser, and I am not sure as to whether this is the proper place to attach a gauge or not. This unit seems to be free enough and not overcharged, but once in awhile it will burn a belt off as a result of the compressor's binding up. It seems only to bind for a half turn, and then it is free again and will spin over when turned by hand.

The head of this unit is not cooled by water and it gets very hot, but the receiver is cool. No matter how long it runs, the head pressure will remain the same as after a few minutes running.

This unit is a 1-hp. taking care of a walk-in cooler and a soda fountain. The cooler has a lowside float with a two-temperature valve in the line. The fountain has a

**lowside float and an expansion valve. If I close the suction line of either one, it will pull down and shut off in a reasonable time. When both lines are open, it seems to run most of the time. The compressor has plenty of suction ability and holds it.**

ANSWER: The head pressure gauge may be attached to the valve on top of the condenser as you have suggested. This is the only compressor discharge valve on the machine, and it will give you the true highside reading.

With regard to the trouble you are having with belts burning out and the compressor sticking, I think this is probably caused by occasional oil slug passing through the compressor, or possibly to the compressor occasionally pumping oil. It is further caused by the possibilities that there is too much tension on the valves or that there is improper clearance through the discharge valve, so that the oil has difficulty in passing through fast enough to prevent the compressor from jamming.

I would suggest that you secure a new valve plate and valve assembly, specifying what refrigerant is used in the system when you order it. No doubt this replacement will clear up your trouble.

## CLEANING CONDENSERS

**QUESTION 419: I have heard and read of various ways of cleaning water-cooled condenser tubes, but the methods suggested all left some room for doubt as to whether or not they could be guaranteed to do the job. I would like to have outlined step by step for me the method of cleaning which, in your opinion, has the best chance of being successful.**

**I have had on several occasions, $SO_2$ commercial jobs acting for all the world like they are air-filled, but purging does no good. These jobs are operating in a confined space, with little air circulation over the condenser and have been operating hot. Is it possible that the hot operation over a period of years has caked, or otherwise covered the inside of the condenser, so as to finally cause very hot operating conditions and high head pressures? Will this caking form an insulating blanket which is enough to definitely slow heat dissipation into the air?**

ANSWER: Out of the several methods that are suggested for cleaning the water tubes and the water cooled condenser, I believe the best one is that employing the use of a fifty-fifty solution of muriatic acid and water, particularly where the coil is corroded to the extent that there is a hard scale formed all over the tube, which is not easily softened.

Where the scale is soft, and has not had sufficient time to harden, sal soda is probably the best means of breaking it up and washing it out. When using muriatic acid and water, it would be necessary to fill the coil with the solution and allow it to stand for anywhere from one to four hours, depending on the thickness of the scale, to thoroughly loosen it up. After this treatment, the scale can be flushed out of the coil with a pressure of clean water. It may be necessary while doing this to shake the coil and tap it with a wooden mallet to break up the loosened scale into smaller particles so that it will pass out of the water outlet.

There is usually some difficulty experienced in getting all this material out after it has been loosened up, due to the fact that it breaks away in rather large pieces, and does not easily pass around the bends of the coil or through any restricted openings.

The action of the muriatic acid can also be speeded up by applying it hot. I would not advise using plain muriatic acid since its action is much faster, and there is danger of doing harm to the coil. A fifty-fifty solution will do the job equally as well, although perhaps a little slower, and there is very little harm that can be done.

## DRYER GETS HOT

**Question 420: I recently overhauled a Frigidaire ice cream cabinet, lowside float, $SO_2$. The old oil and gas were partially evacuated. There was no sign of moisture. I overhauled the compressor, and in re-installing, placed an activated aluminum dryer in the liquid line, a few feet out of the receiver. On opening the valves, I accidentally found the dryer to be hot, while the liquid line, both before and after the dryer, was normal. I removed the dryer and found it seemingly o.k. After re-installation, the system has been operating satisfactorily for several weeks. Could you explain this?**

ANSWER: With the adsorption of moisture by Activated Alumina, from either a gas or liquid, heat is generated equivalent to substantially the latent heat of vaporization approximating 1000 B.t.u. per pound of moisture. For this reason if the recharged $SO_2$ previously evacuated from the system was not dry but contained an abnormal amount

*(Continued on page 54)*

# COMMERCIAL

# *Selling*

AMONG several definitions which Mr. Webster has employed to define the broad subject of "Selling" is a simple one which reduced to its most elementary basis is probably the most easily understood. That definition is simply "To find the buyer."

We in the service and installation business, are constantly being called upon to employ sales ingenuity. In many cases it is the toughest kind of selling because frequently it may be termed "the selling of an intangible," and many times such selling is conducted under the most adverse circumstances. It has been repeatedly said that a good share of the make-up of a successful refrigeration engineer lies in his ability to sell himself—his services—his company—his dependability.

THE REFRIGERATION SERVICE ENGINEER—the installation and service engineer's own trade journal, which has exclusively served the interests of those men engaged in the installation and servicing of refrigeration equipment since June 1933 has been cognizant of a definite trend within the last several years.

This development has been a logical one. Unquestionably, the growing field of service and installation engineers (a large percentage of which are classified as independent contractors) have secured the best possible entree into the prospect's place of business. Being called into a job specifically at the request of a user of mechanical refrigeration who is in urgent need of his services, the refrigeration service engineer has been in a most favorable position to do a constructive selling job. Through his business activity, he is establishing himself as the "Refrigeration Specialist" in his community, and is being called upon more frequently to make unbiased recommendations to his customers. Consequently, many of his sales are being made with very little effort.

In keeping with its editorial policy "that its subscribers be effectively served" THE REFRIGERATION SERVICE ENGINEER with this issue inaugurates a new department devoted primarily to commercial selling which in substance is to provide its readers an opportunity to profit by the experience of other organizations similar to their own who have enjoyed the results of increased business through their sales activities.

In brief, it will be the purpose of this department not only to point out how "to find the buyer" but most important, ***how to sell him***. By practical example, it will endeavor to assist the subscribers by providing such information as can be applied to their own business—all designed to accomplish the obvious purpose of increasing profits through the sales of equipment and accessories.

How do you like this department? Of course, your suggestions are invited, as to how it can be made more profitable to you, and we shall be equally interested in suggestions from subscribers as to the success of their sales efforts.

*Increase Profits by*

# These Service Men Are Trained to Sell New EQUIPMENT

*by John D. Mueller*

**★ Whether he knows it or not, every refrigeration service engineer is a salesman. This is one of the many attributes a good service engineer must have. His contact with the customer in his service and installation capacity provides an unexcelled opportunity to make sales. Here is how one company does it.**

"THE service engineer who will even half try will find himself well able to build an excellent volume of business in the sale of commercial refrigeration equipment as well as many accessories now taken for granted in any modern establishment," asserts Jack Langston, head of Jack Langston & Co., Weber Company representatives in Dallas, Texas, and manufacturers of refrigeration equipment as well as a veteran service organization.

"The service man who would build such a business must first realize that as a service man he has an unusual opportunity to present to his clients what is new, and what will best serve his needs. He should be a salesman of first order no less than a service man," Mr. Langston says.

To this end in the Langston organization, every service member of the staff has been furnished with a portfolio as well as a kit of tools. When he goes on a service call, the portfolio goes along with him. Arrived there and discussing the problems of the client he is in excellent position to suggest changes of equipment, and to show what he is talking about. Ordinarily the customer is then in a highly receptive frame of mind.

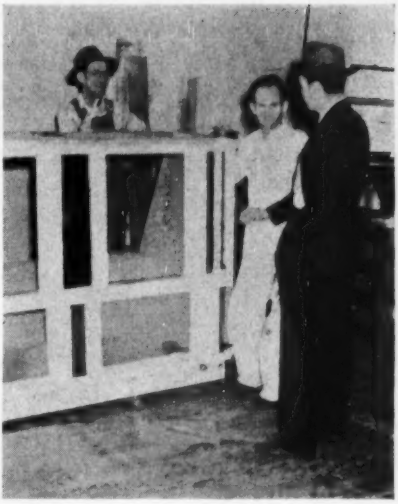
"The service men at such times do not push sales, nor do they try and get the man's name then and there on the dotted line," Mr. Langston explains. "Rather they talk as they tinker with the job in hand. They discuss the new and emphasize its qualities as compared with the job in hand.

**★ Jack Langston finds that there are plenty of pictures showing refrigerator equipment in the most attractive surroundings, but finds there is a dearth of them under less attractive conditions. "Still," he says, "you can sell plenty of equipment to the little fellow if you can show him that he can afford to buy." So his crew shall be able to show equipment under the least desirable physical conditions, Mr. Langston has pictures like this one for sales portfolio use. This is one of the Langston built display cases in a small store. The proprietors are buying it on a meter purchase plan.**

"There is a wide variety of ways in which the service man can talk in a friendly and interesting manner to such prospects," Mr. Langston says. "Perhaps the man's equipment is old and not as efficient as it should be. Perhaps it is not so compact as would best serve his interests. Every one of these angles is open to the service man's discussion under the most favorable conditions.

"I had a man come in just a few days ago who demonstrates what can be accomplished by this method of sales approach. We have sold him three complete outfits in the past five years. He came in and bought a 1941 layout. On every service call we had been showing him what was coming, and talking up what he could best use.

"The service man getting around often to such places of business, if he is at all alert, can observe operation in the man's place of business. He can see definitely where improvements can be made. If he makes it his business to keep informed on the subject of equipment, and will bring along illustrative material, he can keep moving right along, building a greater and greater desire in the customer to possess new equipment. He is neither walking in on a 'cold canvass' proposition, nor trying high pressure sales methods. He is rather steadily building a desire to own.



★ The prospect who enters the Langston establishment in Dallas is likely to find his way into the shop where manufacturing of equipment is in progress. Here the man interested in refrigeration is furnished with an explanation of all the details of building.

"One of the chief reasons we entered the field of building refrigeration equipment in a small way was the very fact that this method of dealing with customers con-

*(Continued on page 62)*

★ "Keeping a wide array of equipment such as scales on hand, has been a big asset to the Langston Company," Mr. Langston says. Here he is seen among part of his stock of scales. Whenever possible, his staff takes a new model to the man in need of service, leaving it there for temporary use. This sells scales and opens the way to refrigeration equipment sales as well.

★ Mr. Langston keeps equipment in wide variety on his display floor. Some of it is of his own build, others of nationally known manufacture. "Getting new equipment out to take the place of that which is in need of service is made easy when a full stock is carried," Mr. Langston says. "It creates the desire to possess the new, and eases the road of the salesman."

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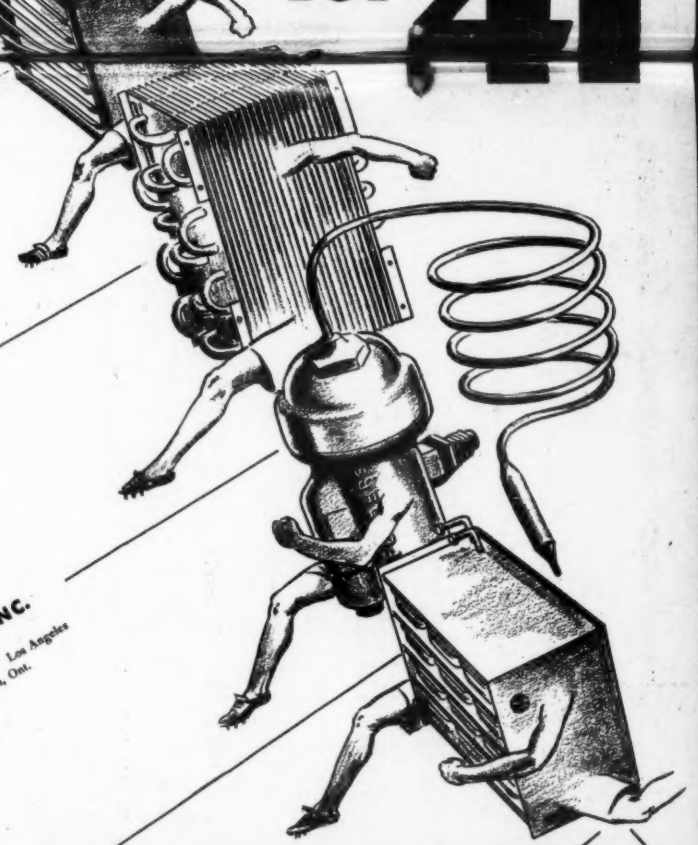

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## "Check-up" Surveys Uncover

*This concern is building an enviable sales record on its reputation established by reliable service—half its prospects for new equipment are satisfied service customers.*

# Basement Service Shop Grows Into Successful Selling Concern

*by E. R. Curry*

A MODERN refrigerator sales and service concern, serving a population of approximately 450,000, which in ten years grew from nothing to gross sales of better than $100,000 in 1940, is, in brief, the story of the McCarty Bros. Equipment Corp., at 7811 W. Lake St., River Forest, Ill., a western suburb of Chicago.

In 1930, Walter McCarty and Robert Dresen launched the new enterprise in the basement room of Walter's home at 700 Ashland Ave., River Forest, under the name of the Western Equipment Co. It was strictly a service business and the young men did all their own service and shop work, as well as janitor and office work. They started on a "shoestring," with limited financial resources. They preferred to start in that way, with a minimum overhead, even though potential profits might not loom so large. Prospects were obtained by personal calls and by a small display advertisement in the local telephone directory.

Their competitors at that time considered them small fry and thought they wouldn't last long. But, by the end of eighteen months, the business had outgrown its basement quarters and they moved to 7811 W. Lake St., occupying a store on this business street, 20 x 60 ft., with a showroom, office, parts department and shop. Four years later, the concern was incorporated with Walter McCarty as president. It was not long after occupying the new store that the service business began to mount and competitors who had laughed at the way they started, began to take notice that here was a new and vigorous major factor in the refrigeration service business in that section.

### Telephone Directory Advertising

An effective help at that time was the telephone directory advertising, that and satisfied customers, who passed the good word along to their neighbors and friends. A start was made with a one-eighth page in the classified advertising section, increasing that later to a one-fourth page, and still later to a one-half page advertisement, the largest space allowed for a single customer.

Another important factor of success during these early days, according to Mr. McCarty, was that they kept putting money back into the business, investing heavily in parts and other capital goods until they had an adequate stock for all possible needs.

For the first four years, a large portion of the business was servicing the old multiple apartment house installations and these prospects were obtained through real estate management companies. At that time, most commercial jobs were of the old ammonia type equipment and very little of this work came their way.

During this time the business continued as a strictly service concern, selling nothing but parts. However, through their service work they saw opportunities for many sales which can best be described as "push-overs." With no attention at all on their

part, the opportunities for these sales were right before their eyes because they had built a background of confidence and good will through efficient service work. In the course of their work they serviced many obsolete individual household refrigerators and in this way noted many good prospects for a new household refrigerator.

### Dealers for Kelvinator

It was a natural development, therefore, to start thinking along the line of selling new equipment. Accordingly, about 1933 they took on the Kelvinator line as dealers for household and commercial cabinets and shortly thereafter, the company was appointed factory representative for Kelvinator.

The service work continued as before, and in addition they began to sell some new equipment, mostly replacing old cabinets, both household and commercial. These sales were accomplished, not because they were sales minded, but because they had built a reputation for good service and their service customers became natural prospects for new equipment.

The first sales of equipment were not profitable, because they did not understand costs. Within a few months they were offered a franchise as Kelvinator commercial distributors and in order to carry on this work effectively, the first salesman was employed. This man, an experienced salesman, took most of the service accounts, called on them and in the words of Mr. McCarty, "sold a terrific amount of equipment." About this time the concern also was appointed distributors for Tyler Display Cases.

It was about 1935 that the two partners began seriously to consider the future, how they were going to grow, and along what lines. It should be mentioned here, that although River Forest adjoins the city of Chicago, the population in this section is relatively sparse as compared to a city location. The territory now covered extends in an eight to ten mile radius, north, west and south, with a population of about 450,000.

Seriously considering the company's position, Mr. McCarty came to the conclusion that even if they obtained more than their share of the service business in that territory, it still would not provide a large enough volume to pay a reasonable return, even though at this time the service business had shown a steady gain every year.

### Quarters Enlarged

It was about this time that a switchboard was installed and another store room was rented adjoining the one occupied. As Mr. McCarty still continued to analyze the business, he came definitely to the conclusion that a much larger volume of business could be built through sales than through service exclusively. Through their service work they were well and favorably known to a large number of people, many of whom were already in the market for new equipment.

Going after sales, they found was a new proposition, quite different from service, requiring an entirely different approach, and more personal work. Another salesman was employed and in 1937, Mr. McCarty turned his entire attention toward building a sales organization.

Carried along on its own momentum, the service business continued to grow, even though no promotional efforts were made. Service calls per customer became less frequent, but the increase in the number of customers through new sales made up for this per capita decline.

Even though the service department continued to show a nice profit, Mr. McCarty still believed that for the long time future, a strictly service business would not increase his business as fast as he would like. As a result of his decision to get definitely into sales work, early in 1938, he purchased his partner's stock in the concern. At this time, the name of the concern was changed to the McCarty Bros. Equipment Corp. It was then that a definite start was made toward developing a sales organization and after about six months intensive work, the sales department was placed on a profitable basis. All salesmen employed have had some selling experience, not necessarily refrigerating equipment.

In the meantime, the service department continued on a satisfactory basis, showing

a gradual increase each year until 1940, when it leveled off, and prospects are that it will remain about the same now, with little decrease or increase. This, Mr. McCarty believes, is because both equipment and installation have improved to the point that, if properly operated, a minimum amount of servicing is required.

About the first part of 1939, another division was made in the corporation by the formation of an Installation Department. This department is headed by a competent man who employs men as needed to do the work on installing newly sold equipment. In all installation work, the aim is to install all jobs sold in the best possible manner so that service will be cut to a minimum. This builds a list of satisfied customers and leaves the Service Department more time for C.O.D. service work.

### Service Business Prosperous

The Service Department is, of course, not neglected, evidenced by the fact that six men are regularly employed. Service men are hired on a monthly basis. They have definite instructions, when servicing a job to make a thorough check and to advise the customer exactly what the trouble is and exactly what it will cost to put the equipment in first class operating condition. The policy of the company in its service work is to do a first class job or nothing. No half-way methods are countenanced, because such methods invariably end with a dissatisfied customer.

The policy is always to charge a customer a fair price for parts and a fair price for labor and never to lead the customer to think he is getting something for nothing. In the case of obsolete equipment that is not worth servicing, customers are advised frankly that they should, instead of wasting further money on repairs, junk it and buy new equipment. That this policy has paid is shown by the fact that most of the service customers remain year after year.

The business under the policies as outlined, continued to grow and early in 1939, another store room adjoining the original two was added. The establishment is now housed in these three rooms, the west room measuring 20 x 85 ft., occupied by the showroom and office; the middle room, 20 x 60 ft., occupied by the service department; and the east room, 20 x 60 ft., occupied by the parts department and stock room.

Another factor that has added greatly to the success of the concern, in the opinion of Mr. McCarty, is the fact that everything possible is done to maintain cooperation between the Sales, Service and Parts Departments and this has given wonderful results. Salesmen, for instance, in their regular calls, make known to the prospects that the company operates a first class Service Department. And, if one of the salesmen should sell equipment not exactly fitted to a job, the Service Department conscientiously makes whatever adjustments are necessary without trying to "pass the buck" to the salesman.

As one means of obtaining complete cooperation between all departments, about every six weeks a party is given in the office to which the employees are asked to invite their wives. At those parties, which are purely social affairs, the employees become better acquainted and this goes a long way toward creating a cooperative state of mind. As a result of careful selection and fair treatment, there is a small turnover in all departments and this has added in no small degree in keeping up morale.

The force now consists of Mr. McCarty, president and general manager, a switchboard operator, an office girl who keeps the books and records, a sales manager and six salesmen, six men in the Service Department and an installation foreman.

Sales efforts are devoted mostly to commercial jobs. Until the middle of 1940, one and sometimes two salesmen were working exclusively on domestic sales. But, at that time competition in the selling of domestic refrigerators in that territory became unusually keen, and the attitude of the manufacturers became less cooperative. So sales efforts on domestic refrigerators were decreased, being limited to displays in the showroom and the time one salesman who follows service leads only.

Aside from the time and thought necessary to plan and develop sales, as well as some attention given to the service and installation work, it has been found necessary to continually keep an eye on cutting costs. As an example, display cases were being delivered from the factory direct to the customer, and they never knew when a case would come in and sometimes it would be delivered to a customer at a very inopportune time. Hence, it was difficult to schedule installations.

Early in 1940, a truck was purchased and now all cases are delivered to a loading platform in the rear of the store, where the case, condensing unit and all equipment for a job is loaded on the company truck and delivered to a customer when he wants it, usually at a time scheduled when the sale was completed. As a result, installation costs have been greatly reduced.

Although separate books are not kept for the three different departments, certain records are kept for each department separately so that costs and profits for each may be readily ascertained.

By the end of 1940, the company was selling all types of refrigerating and air conditioning equipment. Air conditioning sales during the past few months have been very successful, chiefly because, according to Mr. McCarty, layouts to fit individual conditions and designed to perform with the highest efficiency possible are made for each job. As a result, this concern during 1940, handled over 50 per cent of the air conditioning installations in its territory.

The advertising program now includes an advertising schedule in local trade papers and a display advertisement in the classified section of the local telephone directory.

About half the prospects for sales of new equipment come from former service customers and the other half, from cold canvassing. Each salesman is required to do a certain amount of canvassing each day and this has brought good results. Cards are provided on which salesmen enter the name and address of the prospect, data on calls, etc., and these are followed up until the sale is completed.

# Birdseye Retailers May Now Use Any Refrigerated Cabinet

## Opens Field for Sale and Installation of New Low Temperature Equipment

REFRIGERATION sales concerns will be interested in knowing that Frosted Foods Sales Corp., New York, N. Y., which handles national sales for Birdseye frosted foods, has adopted a revised policy of allowing the retailers of Birdseye brand to use any approved make of cabinet. Heretofore, sale of such equipment to Birdseye dealers was practically closed because of the established policy of permitting the merchandising of Birdseye foods from only one make of low temperature cabinets which were leased to the retailer.

The Frosted Foods Sales Corp. for the past five years has been purchasing cases made by the American Radiator Co. and leasing them to the retailers for periods of three to four years, at the end of which time, the leases were renewable. This is the only arrangement dealers of Birdseye Frosted Foods had been able to make.

Under the new arrangements, any store distributing Birdseye foods may decide for itself the kind of refrigerating equipment desired, whether it will buy some other type of equipment or lease or purchase outright the cases which will still be made available by the Frosted Foods Sales Corp. The only stipulation is that the cases installed must operate efficiently and maintain a uniform temperature of not higher than 8° F.

At the present time, Frosted Foods Sales Corp. has a total of 8,700 authorized retail outlets for Birdseye Frosted Foods, but news reports indicate that it is planning to add 5,000 and possibly more dealers next year. On these bases, it would seem likely that cabinet sales to these dealers would amount to something like 12,000 cabinets within the coming year and since dealers are now privileged to make their own selection of refrigerated cabinets, another field is opened for the sale of this equipment.

*Cooperate—Don't Compete with Dealers is this service company's policy*

# SPECIALIZE, *Says Donaldson*

*by Robert Latimer*

★ **On all questions, The Refrigeration Service Engineer is interested in presenting its readers both sides of the discussion. Here is a service company that had to make a decision regarding its sales-service policy. This article tells how it worked out.**

IF you are a refrigeration and electrical service company don't compete with the sales companies that send you business, advises Carl W. Donaldson, president of Donaldson's Refrigerator and Radio Service Company of Kansas City. Several years ago this firm was in both sales and service. In 1937 they came to the point in business where they were forced to choose one or the other. They studied both fields and chose service because they believed there was more actual need for good service companies in this area than sales firms. Since that time appliance dealers alone have sent them more dollar volume business than they could have possibly hoped for had they turned to sales.

## His Formula

According to Mr. Donaldson the formula for this success is to be found with a glance survey at any field. Dealers will not send their customers to a service firm to purchase merchandise which they (the dealers) carry in stock; they send them there for service. And as long as a service man isn't in competition with a dealer he will get that dealer's business. When he builds up this sort of a reputation, he will get other dealers' business, as Donaldson's have proved.

Here the most important item appears. With dealers sending the service companies a continuous flow of new customers, there is the opportunity, through a strictly regulated policy of unconditional warranty of work, to gain these new customers as regular clients for service on all their appliances.

## Don't Object to Making Good

There is a "first commandment" at Donaldson's which reads: "Don't object when you have to make good on a guarantee of service. It's the best advertising you can get. It doesn't make much of an impression on customers when you guarantee your work, but when you make good on this guarantee to the customer's satisfaction you can bet his recommendations of you alone will return in actual dollars five times what it cost you to make good on the guarantee."

In rendering the type of service that will make new customers permanent customers, Donaldson's have set up a very rigid check on all work. Believing that proper analysis of the trouble is 50 per cent of the job, only experts enter into this part of the picture. A large budget for the purchase of equipment that can do the job better keeps the shop modern. Extensive drive-in facilities

are provided and have resulted in gaining a large portion of the commercial refrigeration dealer and appliance retailer installation and service business.

Just how valuable this completely equipped and guaranteed service has been to Donaldson's is demonstrated by the fact that the local Packard motor company, when this company's 1940 model came out with its complete air condition unit, appointed Donaldson's as the company to make these installations.

Another "first commandment" is Fair Price—do just what is needed to the appliance to insure trouble-free operation. This is the largest single factor in securing repeat and customer recommended business. No amount of money can buy this type of a reputation—and there's no advertising that can touch it for year after year results.

"In the service end of the game, the difference between selling and merchandising service is the difference between showing good gains year after year and making an excessive profit on a few over-sold service jobs," Mr. Donaldson believes. "If you intend to stay in business any length of time you must get on your customer's and his friends' calling list regularly. A satisfied clientele is your best advertisement. Get this business by planning for it.

"A strictly service company has many advantages. Its business isn't as seasonable as sales. You get refrigeration and electrical jobs that do not involve appliances. With more new items each year calling for expert service, such as air conditioning, you can get that business too, because you are specialists in that field.

"We have found that to get the most volume in service you must get the dealer-recommended business. You can get this by not competing with him, by doing the best work possible at a fair price and by providing facilities at your firm to render fast, efficient installation service. Nothing impresses a new customer quite as much as having him drive into your modern, on-its-toes shop."

So, he advises, play fair with customers and completely cooperate with dealers, and you'll have more business than you can handle.

## Profits and Pitfalls of Locker Storage Plants

SOME day Texans will walk into a "locker storage plant" and pick up their Sunday beef roast just as handily as they now get mail from a post office, a University of Texas engineer believes. W. R. Woolrich, University engineering dean, has published in a recent issue of the University's engineering journal, a complete discussion of the profits and pitfalls of locker storage, which he defines as:

"A suitable freezer storage plant preferably held at zero deg. Fahr. in which cabinets or lockers are provided for rental to the residents of a community for preservation of meats and perishable vegetables and fruits."

Here are some facts, according to Dean Woolrich, about locker storage: A typical 300-locker refrigeration plants costs about $10,500 and rents between $10 and $15 a year per locker, which includes cost of operation. Average locker users can store 400 or 500 lbs. of food at an estimated saving on family food budget of one hundred dollars a year. You may make economical purchases on large amounts of perishable foods and have in an out of season at a centrally located frozen food depot. Storage plants may be operated in connection with food processing plants, ice plants, creameries, cold storage warehouses, grocery stores, skating rinks, or cheese factories.

"It is not a service that should be promoted by outside dealers whose only interest is volume of equipment sales," he said. "Active, alert business men who are interested in extending a service that will do the most good to the most people are the type to promote these enterprises."

S S S

**O. F. Porter,**
**Oregon.**

**I think your publication one of the best of its kind.**

---

**H. Salzman,**
**California.**

**I find this little magazine an education as well as a text book.**

## The Question Box

*(Continued from page 42)*

of moisture, it would be expected that the heat of adsorption generated would be of a magnitude comparable to the observed localized heating. Had the $SO_2$ been dry when recharged, substantially no increase in temperature at the Activated Alumina dehydrator would be observed provided the system was dry and had no loose connections permitting moisture infiltration. The Activated Alumina dehydrator in question is probably saturated with moisture and to protect the system for continuity of service, it would appear advisable to install a new cartridge in the upright or vertical position.

The observed localized heat is further evidence that the hydrator was adsorbing both rapidly and effectively the soluble, as well as any entrained, water.

In view of the experience indicated, it would appear that a refrigerant removed by evacuation or otherwise from a unit should be passed through a dehydrating agent in the event the refrigerant is to be subsequently recharged into the system. Precaution should also be taken to dry out the system prior to charging.

### AIR CONDITIONING

**Question 421:** It has been my idea of late to make a room cooler, portable and air-cooled, and I would like to have some of your ideas as to what to use and how they affect the health. There are several on the market, but I do not know how successful they have been. Their price ranges $135 and up.

I have in mind using a new ½-h.p. Kelvinator Freon compressor, a ½-h.p. Century motor, Peerless (Thermek) unit cooler, 4,000 B.t.u. capacity per hour. Since these units are running at all times, when it is necessary to use them, what kind of control valve would you recommend for the Freon? This is to be used to lower the temperature of a room 20 x 20 x 9 feet from 100 degrees F. to 80 degrees. At what temperature do you think the refrigerant in the unit cooler should be held?

There are a number of different forms of lights used now in display cases for meats, the purpose of which is to destroy some of the bacteria in the meat, and so forth. How successful are these? And are they worth the price and operating cost?

**What should the humidity and temperature of a room be for all around health and comfort, during summer and winter?**

ANSWER: I believe that you are going to go to a great deal more expense than is warranted in attempting to make one of these coolers yourself. Since you are engaged in the business of refrigeration, you should be able to secure a room cooler of this type at a dealer's price, and I am of the opinion that you could buy one already made much cheaper than you could make one yourself.

I gather that you are not very much acquainted with air conditioning, and in the building of one of these you will have to do considerable experimenting and will make quite a number of errors before you arrive at anything satisfactory. If you have any intention of following up such an idea, I would suggest as a first move that you get a book on air conditioning and make a study of the necessary factors entering into the problem.

You state that you have a room 20 by 20 by 9 feet to be cooled from 100 degrees to 80 degrees. Without using any figures to arrive at a definite answer, I would say roughly that such a room would require a 1-h.p. or a 1½-h.p. unit to cool it and that a ½-h.p. unit would be of little value.

With regard to the lights used for the purpose of destroying bacteria in display cases and meat boxes, insofar as our information goes, these devices are thoroughly satisfactory and well worth the installation and operating cost. The operating cost, incidentally, is very slight since they require very little wattage.

### Proper Humidity

With regard to proper humidity and temperature of a room, the ideal temperature and humidity for living conditions and perfect all around health conditions would be 50 per cent relative humidity at a temperature of 70 to 75 degrees. However, for various reasons, it is not practical to maintain these temperatures and humidities throughout the year. For instance, in the winter time, it is not practical to keep the humidity above 40 per cent because if we do so, we will experience considerable sweating of the walls, windows, and even the furniture in the room. As a usual thing, a humidity of 35 per cent in the winter time is about the maximum one can maintain without some of the other disadvantages cropping up. It is not practical to maintain a temperature of more than 10 degrees lower than the outside temperature in the summer for the reason that a sudden change between the outside and inside temperatures of more than 10 degrees is too hard on people entering or leaving the building.

Therefore, to create a more comfortable condition during the summer, we find it advisable to reduce the humidity to approximately 30 or 35 per cent while maintaining the temperature about 10 degrees lower than the outdoor temperature. In this way, we can reach a balanced condition, which will provide comfort to the average person.

## DISPLAY CASE TOO WARM

**QUESTION 422: I wish to ask you a question on the cooling of a case which I have tested, and I think I know the trouble, but wish to ask if you may know of any way to make a positive test to determine if I am absolutely correct or not.**

**In a counter case there are two cooling coils LS floats about two-thirds of the way from the top, and one in the bottom of the case. The compressor operates all the time, so I installed new float valves and an overhauled compressor, as the old one had bad valves, and now the coils frost all over, but the compressor still operates all the time.**

**I have taken temperature readings in the case on the top shelf, where the reading was about 48 degrees. On the bottom part of the case, the reading was 32 degrees. I have come to the conclusion that the leakage is so great that the floats do not get down to where they should shut off to control the flow of refrigerant because of the warm condition of the case.**

**If I am correct in my diagnosis, what would you recommend doing to make sure this is the case, and to find out where the many leaks may be. I thought you might know of some means that have been worked out for finding leaks other than the method of looking and looking.**

ANSWER: The temperatures you have given me indicate there is a 16-degree temperature difference between the top and bottom of the display case. This indicates there is very poor circulation in the cabinet, and because of this fact, it is very likely that the bottom coil is doing little or no work at all. Regardless of what other conditions exist in the refrigerating system, this condition should be corrected first, and without its correction, it is hardly possible that satisfactory operation can be obtained.


# RECOMMEND PAR WITH *Confidence*

**Protect your own reputation and insure your customers' complete satisfaction by installing PAR refrigeration units. You can recommend PARs with full confidence . . . because they are designed, engineered, and precision-built as complete units (not just a collection of sub-assemblies hung together) to render peak performance, maximum economy, and extra years of trouble-free service!**


Par Condensing units are made in both air cooled and water cooled models 2 or 4 cylinder, 30 sizes to fit the needs of any application from 1/5 to 20 H. P.

***Send for FREE CATALOG***

***or see PAR units on display at your jobbers.***

MODERN EQUIPMENT CORPORATION • DEFIANCE, OHIO

One method of correcting it is to install an air duct at one end of the case with a fan in it, so that the warm air from the top of the case will be drawn down to the bottom, thus creating a forced circulation. The duct itself would not need to be more than about 3 x 8 inches in cross sectional area, and of sufficient length to reach from the top of the case to the bottom. Any tinsmith could make up this duct for you, and a six-inch fan would provide sufficient circulation.

All this is apart from the possibility that the leakage into the cabinet is greater than the capacity of the unit. It may be that after this work is done you will still find that the machine has not enough capacity to handle the job. However, I believe that increasing the circulation in the cabinet will go far toward correcting your trouble.

There is the possibility, too, that there is too much oil in the system, or that the blanket of oil floating on top of the refrigerant in the coils is so heavy that the vapors have difficulty in penetrating through it. This will be evidenced by a very low suction pressure at the compressor, while a comparatively high temperature is obtained at the coil. You might check this condition by determining the temperature of the coil itself, and from the pressure-temperature relation chart for the gas used, determine what pressure the gas is in the coil. In comparing this with the suction pressure at the compressor, you will have some idea of whether or not you are getting the true suction pressure.

There is always a difference in temperature between the gas in the coil and the temperature of the outside of the coil. This difference is about 5 degrees.



## OIL IN FLOAT

**Question 423: Would you please give me some information on the following machine? It is a Gilson Canadian make, has a lowside float, ¼-h.p. motor, single-cylinder compressor having a pair of piston rings with the suction valve in the piston, and discharge valve on a plate.**

**This machine would not shut off, so I changed the suction and discharge flapper valves, which made an improvement. However, the machine still runs too long. Do you think I should change the rings also? The unit will not pull a vacuum of more than 22 inches after the suction service valve is shut off. Do you think this is due to the rings being worn? Do you think it advisable to take the evaporator apart to examine the needle valve and seat? If this valve were worn, would it not hiss all the time? The suction gauge shows that it operates about 6 inches of vacuum till it gradually pulls down to 11 inches, when it cuts off. The gauge also fluctuates from 6 inches to 2 inches. Is this due to the opening of the needle valve at intervals?**

Answer: I think that if you are getting a suction pressure of 6 inches of vacuum that is about the maximum you should need from this unit. Also, if you are able to draw a 22-inch vacuum on the compressor against a normal head pressure, your compressor is working very nearly at its maximum efficiency. At a 6-inch vacuum, the evaporator temperature should be about 5 degrees Fahrenheit, which is about the point required on household refrigerators.

The fact that the suction pressure gradually pulls down to 11 inches where the unit will cut off, indicates to me that there is some trouble in the evaporator itself, and the trouble is very likely due to too much oil in the system, or in other words, to too heavy a blanket of oil on the evaporator. The fact that too much oil is being maintained in the evaporator may be due to too much oil in the entire system, or it may be due to im-

proper calibration of the float arm.

I would suggest that to start with, you pump the entire system down, at the same time heating the evaporator so as to drive the oil out of it and endeavor to get the oil back to the compressor. After you have done this, the compressor should be checked for the proper oil level, and if it is found to contain too much, remove the excess oil, then repeat the entire operation.

If no excess of oil is found, then I can only suggest that you dismantle the evaporator and recalibrate the float so that it will float at its proper level.

## NEEDS TWO EXPANSION VALVES

**QUESTION 424: I am referring to a walk-in cooler which I have been taking care of, and which has two long-finned coils hooked in series with one thermostatic expansion valve controlling the refrigerant.**

**The coil receiving refrigerant first has a tendency to frost badly and accumulate ice, whereas the other frosts on the on-cycle and defrosts on the off-cycle, which is the way both should do. Is there any way to correct this without using two thermostatic expansion valves? If a thermostatic expansion valve were used for each coil, should the inlet enter at the top of the coil or the bottom for most satisfactory results?**

**The above job is a ¾-ton Kelvinator pressure-controlled unit. Part of the time it short-cycles, that is, when it cuts in, it runs perhaps for one-half minute and cuts out, then cuts in again and runs the regular cycle. What in your opinion is the cause for this?**

**Should a dehydrator, such as Drierite, for permanent installation be left in the line permanently, or what is meant by permanent installation?**

ANSWER: As you have suggested the only real way of correcting your trouble is by installing another expansion valve, thus splitting up the two coils into two separate circuits.

There is one other thing, however, that you might try, which may improve the condition. That is to install an equalizer line between the outlet of the expansion valve and the inlet of the second coil. It will be necessary, of course, to install a T at these two points in order to take off the equalizer line. In doing this, you will be equalizing the pressure at the inlet of each coil, and a certain amount of refrigerant will be bypassed from the expansion valve to the second coil direct.

It may be necessary after that to readjust the pressure control, raising the temperature so as to compensate for the reduced pressure drop through the two coils. I believe that this will also overcome the short cycling you are experiencing. However, if not, I would suggest that the valve be tested to see that the needle seat is holding properly.

Dehydrators designated for permanent installation are usually those containing a dryer agent which will not powder or deteriorate in any way when moisture-saturated.

Silica Gel, Activated Alumina, and Drierite are all considered suitable for permanent installation. That means, of course, that the dryer can be left in the system permanently, or until such time as trouble at the expansion valve indicates that the dryer is no longer absorbing moisture.

## MAJESTIC UNIT TROUBLES

**QUESTION 425: I have here in my shop a household Grunow refrigerator with a Model K compressor. The complaint was that the overload switch on the control unit would kick out every two or three hours, and naturally would have to be reset by hand. I replaced the stator, as it looked burnt, the**

Carrene meter, and put in a fresh charge of refrigerant and oil (of course, I dried the unit with a blow torch while I had the system under vacuum). Now this unit will run very long with very little refrigeration, and then at times the overload button will kick out as before. It seems to me that the motor lacks power, or it's doing too much work. At any rate, it has me puzzled.

I also notice that there are many such units in town, and most of the complaints are the same. What causes the overload button to come out? Where is the overload?

ANSWER: An overload on a compressor is usually caused by one of three things: First, to a compressor which is binding or is not getting sufficient lubrication; second, to air in the system, which creates a high head pressure; and third, to an overcharge of refrigerant, which in this case will not create a high head pressure, but may flood the compressor with liquid refrigerant and prevent it from getting sufficient lubrication.

I would be of the opinion that your particular trouble is due to one of the last two items, and I would suggest that you proceed with purging the unit from the purge valve at the top of the carrene meter, in order to insure the proper removal of any air that may be in the system. Then, as the unit begins to reduce in temperature, I would note the temperature of the suction line to be sure that this line remains warm through the entire operation. If there is any indication of its becoming cool, and gradually colder, you can be sure that the system contains too much refrigerant and is flooding down the return line.

On the other hand, if there is no indication of the return line flooding and the evaporator is not cold all the way to the top, this will be an indication that there is insufficient refrigerant in the system, and it will be necessary to add a small amount until the evaporator is frosted over its entire height.

The Carrene meter, as you probably know, is nothing more than a capillary tube combined with a receiver and a dryer, and the system should be charged in the same manner that any other flooded type system or capillary tube system is charged.

S S S

Mr. Conrad Kaiser,
Wisconsin.

You have a wonderful magazine which I read faithfully, depending on it to teach me the latest in the field.

## THESE SERVICE MEN ARE TRAINED TO SELL NEW EQUIPMENT

*(Continued from page 45)*

vinced us that it could be profitable. Often there is found a customer who wants and needs specially designed cases or reach-in or walk-in coolers to fit speciel requirements. The service engineer who will carefully study such situations will find, it is our experience, that he can sell such customers high quality custom-built equipment.

"It might be held that the cost of building such equipment is prohibitive. This is far from true. We have been building on this basis for some time now, have placed every piece of equipment we have built, are furnishing highly satisfactory service, and have built it at costs which give us fair enough profit when sold at prices which compare with those the buyer would have to pay for any standard make of equipment.

"Building equipment will make any service man a better engineer. To produce a piece of refrigerating equipment which will operate and succeed, he must know his business. He must deal with the basic principles of refrigeration when he builds. He cannot remain in business if he be merely a tinkerer about.

"In our business here we sell many of the familiar accessories to be seen in any modern food store. We stock scales, meat choppers and grinders, slicing machines, power saws, etc. In this field, as in refrigeration, we service as well as sell. Just as with the refrigerators, our service men have illustrated data of these accessories in their portfolios.

### Service Man Has All Data

"When one of my service men goes out on a scale call, for instance, he has all of this data with him. Usually he already has shown the customer material of this sort. Often as not, he will take a new model machine along when he starts. He is bringing something the customer already has heard about, and which he has seen in picture.

"Our experience is that whenever possible, a new machine should be left for use while the old one is taken to shop for service. You give him an opportunity, obviously, to use something you have already suggested. In a great many instances the man you left the equipment with will want to know what allowance you will make on the old. Often we have such men call us on the telephone and ask about buying the new machine we left for use while we serviced the old one.

"The service engineer is the fellow the customer turns to when he is in trouble. The service man can talk equipment as he works, when the man he is talking to is receptive of mind. He can lay a solid foundation there for sales of equipment—at a profit.

### Must Be a Good Engineer

"What he must be first is a good engineer. If he isn't, the customer can't have much confidence in him, or what he says. He must be observant, and be able to estimate accurately what a man can use profitably in his business. He needn't necessarily be a 'hot' salesman. He should be able to talk the equipment he is trying to sell—know all he possibly can about it.

"Every service call, assuredly, can't be hoped to produce a sale; but every call can be made a substantial stone in the foundation for future sales. Further, every service call can become a highly desirable source of information to the man making it. After all, the man he is serving is in business, hope-

ful of success. Constructive discussion of his business will certainly provide useful information to the man making the call.

"If the service man will get out of his mind the idea that he is merely a fellow in overalls, come to a place to do some fixing, for which he will be paid, and think of himself as one who is there primarily to help the other fellow make a living he will find himself taking an entirely changed measure of both himself and his patron.

"The service man, obviously, can't be a butcher. But he can get a really constructive picture in his own mind of the jobs and the difficulties facing the butcher and others. When he has done that, and if he also has the technical knowledge and skill, he can talk to any man using refrigeration, and show him how he can do things better than he has been. And when he can do this he will sell equipment."

S S S

Mr. G. L. Tomlin,
Georgia.

This marks our fourth year of complete files on the best magazine published in this business and we certainly hope nothing will stop us from continuing.

## HERMAN GOLDBERG'S ANNUAL PARTY

AS usual Herman Goldberg's annual Christmas party was a huge success. Held in the North Ballroom of the Stevens Hotel in Chicago on December 11, the party was attended by more than 500 people from all branches of the industry and from all parts of Illinois and neighboring states.

A floor show of several first line acts, music, and dancing provided the main entertainment for the evening, while two dance contests added to the general fun. Winners of the waltz contest were John Annis, Chicago Lipman distributor, and Mrs. Rist. The Jitterbug contest was won by Mr. and Mrs. Fred Olds.

Numbered tickets provided each guest when entering, were used in the drawing of several door prizes. Winners were: Mrs. Irving Alter, J. D. Horon, E. Jonesi of Automatic Heating and Cooling Supply Company, and A. Cunningham of Liquid Carbonic Corporation. The grand door prize was won by Dan Karlmeyer of Peerless of America, Inc.

The guests enjoyed the dancing until the late hours.

**VIEWS OF HERMAN GOLDBERG'S ANNUAL PARTY**

A few of the hundreds who attended Herman's annual party, as was caught by the camera of Irving Alter, Harry Alter Company. They are left to right: (1) Herman, the host, addressing the crowd through the microphone. (2) T. C. "Bud" McKee; Herman Goldberg; R. T. McDermott; Art Schellenberg; Mel Knight. (3) Fred Olds; Mrs. Olds; Paul Krueger; Walter Lowitz; Mrs. Krueger. (4) R. Dunlap; Mrs. Bloom; Mrs. L. Fuller; Mr. Bloom; L. Fuller. (5) Ivar Skipple; Jack Glass; Joe Coyne; Joe Coyne, Jr.; J. N. Ott; Al Fine. (6) Willard Prack and Al Weil; "Bud" McKee, center. (7) Bill Metcalf, Mrs. Metcalf, and Mrs. Frank. (8) Rear row: Mrs. Irving Alter; Mrs. McGuan; Mrs. Herman Goldberg; Mrs. Lou Grauer; Lou Grauer. Front row: Mr. and Mrs. Al Weil. (9) Mrs. John Lang; Mr. and Mrs. Henry Kalliff; Mr. and Mrs. Terry McGovern; John Lang. (10) Ed Graff; T. C. McKee.

## HOW COLUMBUS CHAPTER TACKLES CODE PROBLEM

A MEETING was called by the chapter for the purpose of discussing the adoption of a code for the city of Columbus, Ohio. Because they felt that all groups who might be affected by it should be consulted, representatives from all the dealers, distributors, ice cream companies, and service organizations, together with all interested city officials, were invited to attend.

A preliminary informal round table discussion was held just before the official meeting opened with L. H. Hulet, Chairman of the Code Committee, presiding. During this period, Mr. Hulet outlined the necessity of a code and the procedure of forming one.

The official meeting was called to order by President R. C. Kaiser, Jr., who introduced Mr. Welch, Fire Chief of the city. Mr. Welch delivered an interesting talk on "Safety," which fitted in with the main topic of the evening.

Since the adoption of a Code would effect the building department of the city, Erwin Rossbach, engineer of construction of that department, and Gabriel Blummer, building inspector, were invited to express themselves.

They advised that, due to the financial condition of the city, the building department is undermanned. If a refrigeration code became an ordinance it would be necessary to have licensed refrigeration men and an inspector. This would mean another man on the city payroll at a minimum salary of $1,800 per year, and transportation which would total $2,400 per year.

Roger Addison, President of the City Council, was called on for his views. He stated that if a code is what the refrigeration men want, they should be sure every detail is taken care of before the ordinance is brought before city council. This is necessary since the members of council know little about the refrigeration industry and should there be any confusion or objections to the adoption of a code the subject would be laid aside until the difficulties could be cleared.

From this point a varied discussion on the matter continued. Mr. Drillot had a copy of the A.S.R.E. code and thought it would be a good idea to use it as a guide or possibly copy it entirely. He also suggested that we purchase enough copies so they could be passed to each one for examination. It could then be discussed and a committee appointed to make the final decisions.

Bernard Savey pointed out that if the permit fee was put into the general fund of the city treasury, as all other permit fees are, there would be a possibility that we may go a half year without an inspector.

H. L. Scott suggested having refrigeration men licensed only. Forget about a code for the time being. He pointed out that if we had to have a license to do refrigeration work, an examination could be given before a man could qualify, which would eliminate the undesirables. He sited the motion picture projector operators as an example.

Ed Graff amplified Scott's suggestion, and said he believes we will go a lot farther by working on a license and forgetting about a code for the present. He called attention to the situations in other cities where they now have too many inspections which are very confusing. He stated that a lot of manufacturers today are incorporating the safety devices right in the equipment, which eliminates the necessity of our having to worry about it. Chairman Hulet called for a vote to find out how many were in favor of a code and license. Twenty-three were in favor of this motion. Twenty did not favor, and the balance did not vote.

Hulet then wanted to see how many were in favor of a license only. This vote was

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## Columbus Chapter

*(Continued from Page 66)*

never taken, since there were so many remarks and so much confusion. Rossbach said that if you do decide to license your refrigeration men you will have to recognize all men who are doing refrigeration work now, which would mean that you would still have the undesirable operators. However, a new comer would be required to qualify by passing an examination.

Drillot added that we do need a code to put things on an equal basis. As it stands now, anyone from outside the State can come in and sell refrigeration equipment, and as a result there are at least twelve different prices that vary as much as five hundred dollars. The prospect then thinks that the refrigeration men don't know what they are doing, whereas, if we had a code to follow, the prices would be more in line and the prospective customer would not be scared out. Furthermore, if refrigeration men had to have a license to do the work, this would also put things on a more even basis.

Scott retaliated by agreeing with Drillot, but the only thing he had in mind was the expense involved with a code. Furthermore, if we can license the refrigeration men now, we will be able to eliminate the incompetent men and bring out only men who have sufficient knowledge to pass the license examination.

F. J. Zopple believes that a code and license are both good because there are a lot of men "wild catting."

Howard Jones, who contacted the various organizations around the city, said the general attitude toward a code was good.

DeWitt H. Wyatt pointed out that everyone seems to approve the idea, but that we are still trying to find out what is wanted. He suggested that a committee be appointed to investigate and report at our next meeting. This investigation would include a thorough study of codes in other cities and the results they have experienced, also a check up with all other organizations.

Ed Graff suggested that a member of each of the following groups be appointed:

One from a service organization.

One from a contracting organization.

One from an ice cream company.

Bernard Savey moved that the chairman appoint a committee tonight to draw up a code and present it at the next meeting. F. J. Zopple seconded the motion which was unanimously approved.

## *R.S.E.S. Chapter Notes*

**Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.**

### WICHITA CHAPTER

*December 20*—The meeting was held at Ruth's Lunch where a southern style chicken dinner was served prior to the meeting. Frank H. Richards, President, presided.

The greater part of the evening was devoted to the annual election of officers, the results of which were as follows: *President,* Frank H. Richards; *Vice-President,* E. T. Quinn; *Secretary and Treasurer,* Howard Haselwood; *Sergeant-at-Arms,* Clarence Hall.

A motion was made and duly carried that the chapter provide two Christmas baskets to be given to two families again this year.

### TWIN CITY CHAPTER

*December 10*—The annual election of officers took place at this meeting, the results of which were as follows: *President,* A. M. Palen; *First Vice-President,* L. A. Kreckow; *Second Vice-President,* Gaylord V. Randall; *Secretary,* Eugene Coulter; *Treas-*

*urer,* Dean Holmes; *Sergeant-at-Arms,* H. E. Schaeffer; *Board of Directors,* William V. Warner, Arthur G. Larson, and Walter E. Gleb.

After the election a recess was declared, during which Mr. Hansen of Refrigeration Specialty Company provided refreshments.

Another election, which followed after the recess, resulted in the election of Gaylord V. Randall as delegate and C. A. McCafferty as alternate to the convention. The chapter voted that $10 be contributed towards the expense of the delegate.

W. W. Dunn's was drawn for the attendance kitty, but due to his absence, the amount remained in the treasury.

## NIAGARA FRONTIER CHAPTER

The annual election of officers of the Niagara Frontier Chapter will be held in the Como Restaurant in Buffalo, January 8. The new officers will be installed at the chapter's annual banquet on January 22. Fred Cameron is chairman of the banquet.

## DAYTON CHAPTER

*December 12*—The meeting was held in the Engineers' Club where a turkey dinner was served at 7:30 before the meeting got under way. After the regular business of the chapter had been taken care of, Delbert Goll was elected delegate to the national convention and R. F. Yauch was elected alternate.

The annual election of officers followed with these results: *President,* G. G. Orsborn; *First Vice-President,* George Click; *Second Vice-President,* R. F. Yauch; *Secretary,* L. E. Brumfield; *Treasurer,* Stephen Stedman; *Sergeant-at-Arms,* George O. Snyder; *Educational Chairman,* H. R. Shoupp; *Board of Directors,* R. J. Brown, R. E. Wagner, and G. W. Perrine.

## TRI-STATE CHAPTER

*November 12*—The meeting was held in the home of M. E. Harrison in Ashland, Kentucky. After the business of the chapter had been disposed of, the meeting was turned over to Albert Chadburn, a representative of Williams and Company, Cincinnati, Ohio, who gave a very interesting talk on selling services, stating that often the service man passes up considerable business which is there for the asking if he will analyze the job and call to the attention of the customer the conditions that exist in his installation. The meeting was then brought to a close and a luncheon was served by Mrs. Harrison which was enjoyed by all those present.

*December 3*—This meeting was at the home of Forrest Poole in Portsmouth, Ohio. A. W. Gruber discussed at some length the prospect of educational programs for the future, reading correspondence from various manufacturers who would be willing to sup-

ply speakers. Mr. Gruber was asked to make arrangements for these speakers and notify the secretary so that the members could be duly informed. Claude Brunton was elected delegate and C. C. Ackley alternate to attend the national convention in January, after which the educational program, consisting of a discussion on various types of room coolers, their troubles and remedies, followed. A luncheon was served by Mrs. Poole following the meeting.

*December 10*—This meeting was devoted entirely to educational work, and Charles C. Allen of the Alco Valve Company was introduced as the guest speaker. Mr. Allen brought with him the glass evaporator and demonstrated how refrigerants act in coils while in service, and what would happen when a system is shut off and not pumped down. He also demonstrated the valves manufactured by his company and demonstrated with the glass evaporator the proper method of installation.

*December 15*—A Christmas party was held at the home of Mr. and Mrs. A. W. Gruber at Ironton, Ohio. A very delicious meal was prepared by the ladies, and games were played until a late hour, when a quiz contest was conducted between the ladies and the men. The men won by a small margin. Gifts were exchanged among the members, which seemed to create considerable merriment.

ST. LOUIS CHAPTER HALLOWEEN PARTY AND DANCE

St. Louis Chapter, thanks to the untiring efforts of President O. E. Petri, and his able lieutenant, Vice-President E. C. Fix, staged the first of what may prove to be regular affairs, when they successfully launched a Halloween Party and Dance, October 26th. Though more than one hundred and fifty persons in attendance taxed the facilities in every respect, the good music and all around fun helped to keep the crowd amused. Costumes were in abundance, and some were very original as the photos indicate. Mr. and Mrs. Steinkamp, newlyweds, were presented with a bouquet of fresh vegetables, high-lighting the evening's festivities.

### ST. LOUIS CHAPTER

*November 14*—The meeting was held at the Kings-Way Hotel and called to order by President Petri. The guest speaker of the evening, L. M. Perkins, of the Allen Bradley Company, gave a most interesting story on controls. G. W. Schalchlin, their local representative, concluded the evening's educational feature with a talk on servicing magnetic motor starters.

*December 12*—The meeting opened with the showing of the Westinghouse film entitled, "The Middleton Family at the New York World's Fair."

President Petri then introduced C. M. Sanders, Jr. of Westinghouse Electric Company, who spoke at length on the development and needs of the most recent of their products, the "Precíptron" static air cleaner. This provided an interesting paper for the educational session.

A brief period of questions concluded the educational feature.

*December 19*—This was a special meeting called to replace the regular meeting ordinarily held on December 26. After the minutes had been read and various other business conducted, the chapter voted to advance the sum of $18 towards the expenses of the delegate to the national convention. The delegate elected was E. A. Plesskott, and Mr. E. C. Fix, alternate.

The greater part of the remainder of the evening was spent in a lively discussion concerning the forthcoming annual election, and during the discussion a tentative slate of officers was drawn up, to be presented to the meeting of January 9, at which time additional nominations could be made from the floor. All the nominees placed on this tentative slate were consulted for the purpose of determining whether or not they would accept the offices for which they were listed.

### LONE STAR CHAPTER

*December 2*—A motion was made that all future meetings of the chapter be held in the Y. M. C. A. Building. Next in the order of business was the election of the delegate and alternate to the annual convention. H. W. Cline was elected delegate, and J. R. Sparkman, alternate. The chapter agreed to allow $25 towards the expense of the delegate.

A letter from Mr. Johnson of Fort Worth, inviting the Lone Star Chapter to participate in a meeting to be held in Fort Worth on December 11 for the purpose of organizing a chapter there, was read.

A nominating committee was appointed for the purpose of selecting a slate of officers for presentation at the next meeting, when the annual election of officers would take place.

*December 16*—The meeting was called to order by President H. W. Cline, who reported the visit to Fort Worth, on December 11, of four members of the Dallas Chapter, at an organization meeting held by members of the newly organized Lone Star Chapter No. 2 of that city. Members of the Dallas chapter who attended the meeting included Mr. Cline, Jack Langston, Sr., J. M. Bibb, and Miss Elizabeth Bibb.

There was considerable discussion of proposals that arrangements be made with the new Fort Worth group that joint meetings of the two chapters be held at fixed intervals, suggestedly quarterly, and that joint activities be conducted. One such proposal was for a dance to be held early in February at a well-known farm midway between Dallas and Fort Worth. Efforts will be made by the chapter, it was indicated by general discussion, to accomplish organization of chapters in San Antonio and Houston, Texas, in the months ahead. The Fort Worth group will be solicited to join hands in the movement.

Examination for the first group of members seeking status as Certificate Members will be held at an early date, probably in February, following the national convention in Chicago. There have been approximately ten applications for examination received to date, it was reported by Miss Bibb, who is in charge of this activity.

It was decided that in the future appointment will be made by the president at each meeting of a member to be charged with the arrangements of a program for a designated meeting. In this manner, it was indicated, it is believed the problem of working out programs will be materially lessened since difficulty frequently is met in efforts of committee members to meet for discussions.

The nominating committee reported that it will have its lists of candidates for office in readiness for submission at a meeting to be called by the president.

## CHICAGO CHAPTER

*November 26*—The election of a delegate and alternate to the national convention resulted in Harold Getty being elected delegate and Otto Hladilek alternate.

On the educational program for the evening, A. L. Brodie of the Texas Company was introduced and presented a very interesting discussion on the technology of refrigerating oils. Mr. Brodie brought out many interesting points regarding the requirements of refrigerating oils, and described in detail the methods of making various tests on oils, through which such things as the viscosity, pour point, and other characteristics of the oil could be determined.

*December 10*—The educational committee presented a paper on "Low Temperature

Refrigeration," which was discussed at some length. Following this, Pete Bendl, President of the Chapter, appointed a nominating committee, consisting of H. D. Busby, Chairman, R. L. Hendrickson, and John L. Strub. The committee was instructed to draw up a slate for presentation at the January 7 meeting.

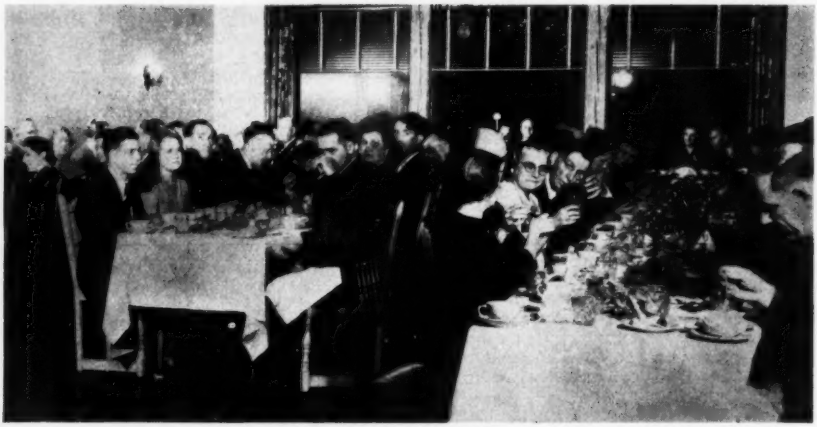
### TRI-COUNTY CHAPTER

*November 7*—After the routine business of the chapter had been disposed of, Clarence Stumpf gave a detailed report on the activities of the Illinois State Convention, held in Peoria. The educational feature for the evening included some very interesting films shown by William Metcalf, and taken by him on one of his western trips. He also showed various pictures of Hollywood stars.

*November 22*—The election of a delegate and alternate resulted in B. V. Clark's being elected delegate, and A. E. Wolff as alternate. Announcement was made that the Mueller Brass Company would hold a soldering contest during the next chapter meeting.

On the educational program of the evening, a talk and discussion on beer cooling was lead by Art Wolff. Wolff brought out the point that because of the advanced brewing and handling methods of today, beer

*(Continued on page 77)*



SECOND ANNUAL CHRISTMAS PARTY OF THE SAN DIEGO CHAPTER

Here is a view of the banquet held by the Long Beach and San Diego, California chapters of the Refrigeration Service Engineers Society on November 30. It was attended by 102 members of the organization and their wives and friends. Among those present and pictured here are the following: Messrs. and Mesdames Everett Brown and E. D. Stanley, Merle Stutzman, Sterling Steiner, A. A. Richards, M. E. Luse, M. M. Canigan, R. J. Moran, T. M. Langwell, M. E. Bucher, D. O. Burge, M. R. Hanks, E. L. Washburn, Dale Shreeves, R. H. Rucker, S. J. Raymond, M. A. Manley, Lyle, Eavans, B. Dietrick, C. W. Ohman, J. P. Pattens, E. L. Murphy, E. K. Willis, E. T. Hogan, J. George, W. R. Cope, Jean Carroll, G. L. Holmes, N. D. Fornell, R. Crofoot, K. Phillips, O. E. Phillips, A. J. Schuller, H. R. Knocker, Paul Travers, L. R. Bournes, F. B. Goodman, D. E. Gunsall, W. K. Beslisle, J. H. Engle, L. S. Gould, E. A. Jacobson, W. Saber, Wayne Bartlett, D. Voorhis, W. H. Crofoot.

spoils much easier than in the past, and that, therefore, it must be properly cooled at all times. With present brewing methods, beer ages as much in ninety days as it did in six months with the old methods. Bottled beer, however, because it is pasteurized, does not spoil as easily as draft beer. Beer, it was pointed out, is just as perishable as milk, but if it is given as much care in handling as milk, it will keep equally as well. Cleanliness was stressed as a very necessary factor to be considered in the cooling coils and in the glassware.

## SAN DIEGO CHAPTER

*November 30*—An early entry into the holiday season was made by Long Beach and San Diego Chapters Saturday night, when they met in a Christmas dinner dance at the Lakewood Country Club in Long Beach. It was attended by 102 members of the organization, their wives, and a guest group from San Bernardino.

Stewart Bell, of Long Beach, and Orville Phillips, of San Diego, were chosen to represent men due for initiation into the respective chapters. They were initiated, and how! They rode the goat, even though it was a mechanical one. Dancing followed. The Meglire Kiddies presented a nine-act floor show. Tiny three-year-old Grace Johnson drew for the dinner prize and led the group in the singing of God Bless America. W. H. Crofoot was master of ceremonies and did a swell job.

The San Diego Chapter will be host to the third annual Christmas dinner dance, to which the members are looking forward with much anticipation.

## FURNITURE CITY CHAPTER

*November 28*—The first order of business elected William Wilbur as delegate to the national convention and Ray Falicki as alternate. The meeting was then turned over to the educational committee, and Mr. Udell introduced Mr. Pollock from the Detroit Lubricator Company, who made a few remarks to the chapter and then introduced Mr. Carter, who presented an interesting discussion on valves and controls.

*December 7*—After several discussions on business matters of the chapter had been completed, the meeting was turned over to Mr. Brat from the Association of Commerce, who gave a short talk entitled, "American Way of Progress." Further business was then conducted with such things as the organizing of a question box, the providing of a door prize for each meeting, and other matters being discussed.

The meeting was then turned over to Mr. Udell, who gave a talk and demonstration on core and pattern making.

Refreshments were served following the meeting.

## TRENTON CHAPTER

*December 2*—The meeting was opened with the showing of Herman Goldberg's motion pictures of the 1940 annual convention held in Chicago. Following the movies, R. D. Marshall gave a talk on Automatic Products' expansion valves and other products manufactured by the company. The talk was very much enjoyed by those present, even though Mr. Marshall was severely handicapped with a sore throat.

## CENTRAL INDIANA CHAPTER

*December 3*—The meeting was called to order by the president, William Sevy, and as the first order of business, a delegate and alternate to the national convention were elected. On the educational program for the evening, Irmal Kruglar of the Beatrice Creamery Company gave an interesting talk, together with figures on the conversion of flooded type brine ice cream cabinets to the new type of direct expansion coils. The talk proved very educational, and the information derived from it was considered highly authentic because of the fact that Mr. Kruglar has collected his figures and information over a period of many years of practical experience in the field.

Vern Nold gave a talk on the benefits to be derived from membership in the chapter. Quite a number of visitors were present from surrounding towns, even though the weather during the evening was quite bad.

## MADISON CHAPTER

*October 8*—After the meeting had been called to order and the minutes of the previous meeting had been read and approved, a discussion was held on servicing commercial systems on a contract basis which called for a monthly check up. The discussion brought out much useful information on this type of service and was enjoyed by all those present.

*October 22*—After the preliminary business of the meeting had been disposed of, the meeting was turned over to R. R. Crosby, of the Frozen Food Section of the Wisconsin State Department of Agriculture. Phil Kramer, Food Inspector of the same department, was also introduced and gave an interesting talk on the Wisconsin Uniform Cold Storage Act, which provides rules and regulations governing the licensing and operation of frozen food locker plants.

*December 10*—Included in the preliminary business of the chapter was a proposal by A. L. Robertson that the chapter conduct a dinner meeting in the near future. After some discussion, the date was set for January 9, and the price of tickets was set at 75c per person. An election resulted in A.

L. Robertson's being elected delegate and Jerome Quam alternate to the national convention to be held in Chicago in January.

### PITTSBURGH CHAPTER

*December 13*—The meeting was held in the Fort Pitt Hotel with S. C. Perry presiding. The educational feature for the evening was a talk and demonstration by A. W. Swift of Handy & Harmon Company. The subject of the discussion was "Sil-Foss and Easy Flow Solders." At the conclusion of his talk, Mr. Swift answered many questions on the applications of solders.

The rest of the evening was devoted to the annual election of officers with the following results: *President,* A. H. Ross; *Vice-President,* Guy Croston; *Secretary,* Paul Belec; *Treasurer,* A. H. Hoerner; *Sergeant-at-Arms,* S. P. Riddle; *Educational Chairman,* Ken Newcum; *Board of Directors,* P. T. McCormack, E. V. Black, and S. C. Perry. An auditing committee was then appointed consisting of P. T. McCormack, E. R. Arn, and Charles Terrill. They were instructed to see that the books of the treasurer and secretary were in order to be turned over to the newly elected secretary and treasurer.

The sum of $28 was voted by the chapter to be paid towards the expense of the delegate to the national convention.

### COLONELS CHAPTER

*December 5*—A. C. Gudkese was elected delegate and E. K. Tingle alternate to the national convention. A letter was read from A. L. Gruber, Regional Director, stating that he planned to visit the chapter on January 2. It was suggested that the chapter have a buffet lunch at the Argo Grill on that night.

*December 19*—The meeting was held in the Argo Grill and called to order by President Tingle. After the business for the evening had been completed, the rest of the time was spent in the annual election of officers with the following results: *President,* H. H. Shuell; *Vice-President,* E. J. Dicken; *Secretary,* H. C. Moore; *Treasurer,* E. K. Tingle; *Sergeant-at-Arms,* Fred Mercer.

### BOSTON CHAPTER

*November 18*—On the educational program for the evening, President C. E. Harris introduced Mr. Oliver Eckels of Mundet Cork Company as the speaker for the evening. Mr. Eckels gave a very comprehensive story on the development of cork and its applications. He also showed a film and provided a description of glass wool and other products of the glass industry. Mr. Eckels answered a great many questions

during the question period which followed. Refreshments were served following the meeting.

*December 9*—Fred Binns was nominated and elected delegate to the national convention, following which President Harris appointed a nominating committee to select a slate of officers for the consideration of the chapter at the annual election of officers.

During a discussion concerning the holding of an annual banquet, it was decided that the affair should be held in February, at which time the installation of officers would take place. On the educational program for the evening, Fred Binns introduced Charles Logan of Superior Valves as the guest speaker for the evening. Mr. Logan spoke on the subject of "Selling Your Services."

Refreshments were served following the meeting.

## ONTARIO MAPLE LEAF CHAPTER

*December 13*—After several business discussions had been conducted, W. Smallwood introduced the speaker for the evening, Gordon Burns, National President. Mr. Burns conducted a lively and instructive discussion on the refrigeration code, in which he was given valuable assistance by Bill Kennedy.

Mr. Donnell spoke at some length on the job Mr. Burns has done as National President of the Society, and Mr. Burns replied with a summary of national executive activities, completing the talk with an appeal to the chapter to make every effort of substantial aid to the British bomb victims in England.

*December 22*—Included in the business conducted during the evening was a financial report of the chapter, which showed a very substantial gain during the past year. Authorization was then given for the transfer of the treasury account to another bank which would be more convenient to the present secretary and treasurer.

Harry Parish, speaker for the evening, was then introduced and spoke on the opportunities of service men for securing in-

creased business, and the part they play in selling equipment. He also explained a short cut method of figuring loads and required equipment for commercial applications. The talk was most enlightening and of interest to all present.

\$ \$ \$

## NEW CATALOGS AND BULLETINS

General Controls Company has just published its 1941 catalog. It consists of 48 pages and is complete with engineering description and charts, performance tables and diagrams of each item in the company's line of automatic pressure, flow and temperature controls.

In the catalog are listed the new V-300 gas regulators for low pressure installations; a new manual reset valve, the MR-1-2, for control of liquids, vapors and gases, the complete new line of T-80 series thermostats, and the new K-15-F valve for control of refrigerants.

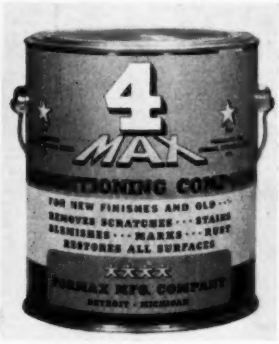
Copies of the catalog, No. 50, may be obtained by writing General Controls Co., 801 Allen Avenue, Glendale, Calif.

\$ \$ \$

## RECONDITIONING COMPOUND FOR ALL FINISHES

An amazing new white reconditioning compound, designed for restoring, reconditioning and protecting enamel, porcelain, metal, lacquer and plated finishes, has been perfected by the Formax Manufacturing Company of Detroit, and now is being marketed for use by refrigeration and other appliance dealers. Known as 4-MAX All-Purpose Reconditioning Compound, this new product, the result of exhaustive research, marks the first outstanding improvement in a reconditioning compound in more than fifteen years.

The new 4-MAX Reconditioning Compound actually serves four uses. It is a rapid acting cleaner with a smooth time




and labor saving action that includes four distinct and thorough operations. It removes unsightly blemishes, scratches, stains, marks and rust; it blends the disfigured surface area into the surrounding finish easily and evenly; it leaves a smooth, clean, fully restored finish; and it completes the work by waxing the entire surface to a high luster.

4-MAX Reconditioning Compound includes in its formula a skillfully blended wax agent. It is the functioning of this particular ingredient that results in the rich, transparent coat of wax that protects the restored and reconditioned surfaces. And the use of a newly perfected, extra soft type abrasive guarantees the compound against gouging, scratching or roughing. Because it is pure white, there is no danger of 4-MAX Reconditioning Compound staining or discoloring the finest enamel and lacquer finishes.

The manufacturers of 4-MAX Compound recommend it for refrigerators, ice boxes, ice cream cooling units, water coolers, porcelain and enamel stoves and ranges, soda fountains, dairy bar equipment and fixtures, kitchen sinks, basins, wash bowls, bath tubs, shower stalls, bathroom and kitchen tilework, brass and nickel house appointments and fixtures, chrome work of all kinds, metal plat-

ing, and enamel and lacquer finishes. The compound is designed to give equally excellent results when used on synthetic lacquer surfaces.

One of its broadest uses is for new finishes that have been marred or disfigured in shipment or during installation. And it is equally useful and effective in the complete restoring of old finishes. As in the case of other Formax rubbing products, the new reconditioning compound is laboratory tested to insure consistent quality for varying performance and results. Its swift, positive performance together with labor and expense saving features are certain to make it extremely popular in the appliance field.

Other products made by Formax Manufacturing Company, producers of 4-MAX All-Purpose Reconditioning Compound, include a full and complete line of rubbing compounds, liquid polishes and sanding compounds.

A generous sample of 4-MAX Reconditioning Compound may be obtained by writing the Formax Manufacturing Company, Detroit, Mich.

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complete, in 30"x30"x14" angle iron frame, with monel metal top. Includes ½-h.p. Frigidaire compressor body, fly wheel, valves, condenser coils, receiver tank, and control. In good running condition. While they last—$10.00 each less motor, f.o.b. Chicago. Lang and Epstein, 1140 W. Lake St., Chicago, Ill.

FOR SALE—Tag Dual Pen Pressure Recorders. Head pressure zero to 150 pounds. Suction pressure 30 inches to 30 pounds. Telechron self-starting clock, 110 volts 60 cycles. Original selling price $77.00, used by prominent refrigerator manufacturer, have been thoroughly reconditioned. Limited quantity available at $20.00 each. Warren W. Farr, 1127 Carnegie Ave., Cleveland, Ohio.

BOOKS FOR SALE—Write to Nickerson & Collins Co. for a complete list of books on Air Conditioning, Refrigeration, Ice Making, Cold Storage, Food Handling, Heating, Diesel, Oil, and Steam Engines, Domestic and Small Commercial Machines, and others. These are the best books published today on Refrigeration and related subjects. Nickerson & Collins Co., 435 N. Waller Ave., Chicago, Ill.